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ABSTRACT

A project that focused on how the field of adult numeracy education had been shaped in Australia over the last 20 years sought answers to these research questions: (1) What does the past tell about adult literacy and numeracy policy, provision, and research? (2) Are Australians numerate? (3) What sort of numeracy activities do Australians engage in? and (4) What is the educational context of adult numeracy? Data included surveys completed in 1977, 1982, 1989, 1996, and 1997 and revealed how Australians measured up in relation to world numeracy standards. Findings related to quantitative literacy indicated that, internationally, Australians were probably fairly middling and groups in the society had scores that were predictably low. Data did not tell how numerate Australians were. Descriptions of work being done on numeracy practices--on how people use mathematics in daily lives--suggested that to be numerate was crucial in many ways, including getting and holding a job, being aware of critical safety procedures, to knowing how to use appropriate networks and mediators. Work on numeracy practices had begun to show the extent to which numeracy knowledge was situated and the importance of understanding the knowledge people had before providing possibly redundant or irrelevant learning. In different states and times, different theoretical or political frameworks shaped curricula in powerfully different ways. Australians learned to use knowledge of the field to construct conversations across the educational sectors and, while developing powerful foundational theory was important, leaving space to respond to local needs and strengths was, too. Other countries welcomed professional development and teaching resource initiatives of Australian adult numeracy practitioners. (Appendixes include a 118-item bibliography, interview questions, and abbreviations and acronyms.) (YLB)

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Numeracy in the making: twenty years of Australian adult numeracy

Betty Johnston

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An investigation by the New South Wales Centre

Adult Literacy and Numeracy Australian Research Consortium (ALNARC)

University of Technology, Sydney

ALNARC National Research Program 2001-2002

June 2002

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Executive summary

Numeracy in the making: twenty years of Australian adult numeracy

The first of the four questions that the national ALNARC workplan for 2001-2002 sought to address was:

1. What does the past tell us about adult literacy and numeracy policy, provision and research?

This project has emerged as a partial answer to that question in relation to the adult numeracy field. It is also contributing to an international project on adult numeracy whose overall purpose is to provide a snapshot of international adult numeracy policy, pedagogy and provision over the last 20 years with case studies of interesting and significant initiatives from a number of countries. While the Australian case-study is now complete the remaining research is on-going.

Are there achievements we should proud of in Australia? What are the most urgent gaps to address? What have the last twenty years taught us about adult numeracy?

Are Australians numerate?

Chapter 1 of this report surveyed a range of surveys which give some information about how Australians measure up in relation to world numeracy standards. As far as 'quantitative literacy' is concerned the available findings tells us that, internationally, we are probably fairly middling, and that there are groups in our own society whose scores are predictably low. But they do not tell us how numerate Australians are. Quantitative literacy covers only a small sub-set of the activities that a numerate person should be able to address effectively. We need more information. We need to know who are the people who are missing out on numeracy. There is a new international tool in the Adult Literacy and Lifeskills (ALL) survey materials to measure numeracy, and we could use it to get valuable information.

What sort of numeracy activities do people engage in?

If numeracy is not important in an adult's life then perhaps we do not need to measure it, or keep count of its levels and distribution in the population. However, the work that is being done on numeracy practices (Chapter 2), on how people use mathematics in their daily lives - in work, for leisure, for citizenship - suggests that to be numerate is crucial in a range of ways, from getting and maintaining a job, to being aware of critical safety procedures, to knowing how to use appropriate networks and mediators. It has also begun to show the extent to which numeracy knowledge is situated, and the importance of understanding what knowledge people have before providing other learning that may be redundant or irrelevant. We would benefit from numeracy audits of workplaces and everyday contexts, and we have examples of how this can be done (eg Baynham 1997).

Educational contexts: an international profile

The latter two chapters of the report focus more on the educational context of adult numeracy: on curricula and teachers. Chapter 3 shows how in different states and different times, different theoretical or political frameworks have shaped curricula in powerfully different ways. We have learnt how to use knowledge of the field to construct conversations across the educational sectors. We have learnt that while it is

important to develop powerful foundational theory, it is also important to leave space to respond to local needs and strengths, for example in the Northern Territory. The Victorian Certificate in General Education for Adults is one of the curricula that has flexibility to do this.

Chapter 4 gives a picture of how professional development has contributed to the national scene. When Australian adult numeracy practitioners started to develop international contacts in the early 1990s, they were surprised at how much they had to offer other countries. Their professional development and teaching resource initiatives were particularly welcomed. Participation as international keynote speakers, as guest facilitators, as contributors to international handbooks, as newsletter editors and on the ALL development committee attests to the respect in which Australian adult numeracy practitioners are held.

This international profile however is seen by the national numeracy network as the result of more fundamental achievements. A knowledge base of mathematical knowledge, pedagogical theory and contextualised practice is the foundation of the development of adult numeracy in Australia.

The network has worked hard to keep numeracy on the agenda. It has worked to develop a more complex and a more useful theoretical conceptualisation of numeracy, as well as to construct a new approach to adult numeracy teaching, both of which have drawn on a very wide range of theories and practices. These two initiatives have informed each other, resulting in a strong and theoretically based teaching practice. It is these two strands - the understanding of what numeracy is, and the careful, imaginative and informed development of teaching practice and resources - that are the foundation of our national and international identity.

The current educational challenge is to maintain and build on what we have so far achieved. We have learnt that to be 'incorporated in literacy' was both good - it brought us funds - and bad - it made us invisible. There is strong push at present to incorporate language, literacy and numeracy into vocational education and training (VET). We will need to strengthen partnerships of all sorts: between literacy and numeracy; between language, literacy and numeracy, and the world of VET; between school and tertiary sector numeracy. The challenge is to retain and build on the richness that we have created.

Introduction

Numeracy in the making: twenty years of Australian adult numeracy

While the focus of this research is on the development of the field of adult numeracy in Australia over the last twenty years, it is important to acknowledge that the field is embedded in a background of powerful national and international forces that have created the climate for numeracy to emerge and to change. In *From the billabong to the mainstream*- a monograph that outlines the Australian training and literacy policy developments in the period 1974-1998 - Kell (1998) identifies four 'epochs' in the development of the literacy field. In a later article (2000) he categorises these somewhat differently, and describes education in the last few years as being defined within a paradigm of consumption. Using this description to generate a fifth epoch we have:

'The poor cousin epoch'	1900 - 1974
'The Kangan epoch: participation and equity'	1974 - 1988
'The epoch of the open training market and seamless web'	1988 - 1992
'The epoch of user choice'	1992 – 1998
'The consumer epoch'	1998 -

He claims that 'adult literacy has almost identically shadowed the transformation experienced in the VET [Vocational Education and Training] sector' (1998, p5). If this is true for literacy, then it is even more true for numeracy, tied as it has been to definitions and policies of literacy. It is certainly not possible to tell any story of numeracy without keeping in mind that there is a larger story relating to the bigger policy and structural changes occurring nationally and internationally. Kell argues that the changes to the VET sector since the 'Poor Cousin' era have been profound' and have moved the sector 'from the periphery to the centre of education policy' (1998 p5). With it have come profound changes in the role of teachers, and in the place of numeracy (and literacy) in the VET and adult education agendas.

In this report I want to tell some of the stories of how the field of adult numeracy education has been shaped in Australia over the last twenty or so years. How it first appeared on the very margins of adult literacy, which was itself marginal. How it was influenced by adult education. How it both benefited and suffered from its definition as incorporated in literacy. How it blossomed theoretically and practically. How it learnt from, and contributed to, debates in school mathematics education. How it created original and influential professional development and teaching resources. How the different states responded to needs and policy agendas in different ways. How the hegemonic competency approach and the National Training Agenda is affecting it. How the choice of where it belongs is still open: A kind of literacy? A relation of mathematics?

In terms of Kell's epochs, adult numeracy can be seen to begin as the 'poor cousin', the remedial maths that constituted support for trade students in the 1970s and 1980s. In some ways the realisation that there was a low level of numeracy achievement in a large proportion of the adult population preceded the growing realisation of the extent

of low adult literacy. Many quite well educated people suffered from what has been called 'maths anxiety'. Schools had produced large numbers of people who were not 'at-home' with maths. Thus as 'second-chance' literacy classes took off for adults from the community, so too did numeracy classes. Equity issues were high on the government agenda, community classes with volunteer tutors proliferated, funding was available, the 'Kangan participation and equity' epoch was well under way. International Literacy Year brought more funding, and increasing professionalisation of the field. Over the next years there was a growing emphasis on a more competitive labour force, and as policies became more interventionist, funding to the field became conditional on delivery of VET related outcomes. Accreditation, articulation, competence were the new buzz words. Tendering for 'service delivery' was the new way to go, the new language to speak. Increasingly, the 'client' that drove the curriculum was not the student, but industry. Currently, the Australian Quality Training Framework (AQTF), a new framework for setting and monitoring 'a nationally consistent, high quality vocational education and training system'(AQTF, 2001, p1), claims to include literacy and numeracy in all training. Whether those whose work experience is most threatened by contemporary changes in work will gain by this inclusion is yet to be seen. That the powerful VET agenda will effectively sideline other learning - including numeracy - that is crucial to community development and citizenship is a real danger (Seddon et al., 2002, p29).

One of the stories that this report does not trace is the continuing debate around definitions of numeracy. This is a question that has been addressed in some depth in other work (Cumming, 1996, Johnston, 1994, Johnston, 1996, Kelly, 1997, Lee et al., 1993, Thiering and Barbaro, 1992, Tout and Schmitt, 2002, Yasukawa et al., 1995, Yasukawa and Johnston, 2001). All the variants in the spectrum of meanings for numeracy as they have developed in the Australian adult numeracy community - as a form of literacy, as a critical approach to mathematics, as a meaning-making system, even as 'basic' maths - have had in common a concern with *mathematics used in context.* At the very least then, the definitions garnered from this debate would agree that numeracy is to do with 'using maths in context', and that to be numerate is to have the 'capacity to use maths effectively in context'. It is a rather modest claim, but it is consistent, as far as it goes, with the more extended 'working definition' developed by school maths teachers in *Numeracy = Everybody's Business*, the Report of the Numeracy Education Strategy Development Conference (DEETYA, 1997) and with a range of other international definitions (eg Baker and Street, 1994, Educational Testing Service, 2002). What it is not consistent with is an approach that sees numeracy simply as a 'functional maths' that gives its students no more than a familiarity with rote learnt and decontextualised skills.

One of the aims of this report was to show how 'what numeracy is' has changed as the times changed, shaped by both the agendas of its partners in education and the policy and strategic agendas further afield. Most of the data for the report has come from literature reviews and document searches. However, some of the data for the picture of curricula (Chapter 3) was gathered from seventeen telephone or face-to-face interviews with experienced numeracy practitioners in different states . The four chapters of the report look at aspects of the field of adult numeracy as they have changed over the last 20 years - needs, learners, curricula, pedagogies, and professional development. The conclusion tries to account briefly for some of those changes by indicating the theoretical and policy frameworks in which numeracy has

been located. The resultant report, constrained as all such projects are, by time and money limitations, has only begun to explore these frameworks.

Asking 'who needs numeracy?' Chapter 1 examines what sort of evidence we have about whether Australian adults are numerate, and what sort of evidence we would like. It looks at surveys, raising questions of what sort of numeracy it is that the surveys measure, and whether needs can be teased out in other ways.

Chapter 2 takes up the question of what other evidence we have of adults' needs for numeracy and traces the kinds of questions we might ask if we start from a social practice rather than a skills approach to understanding numeracy.

Chapter 3 examines the changing responses to those needs as exemplified in the different and changing curricula in different states. What factors have constrained these curricula, and what version/s of numeracy have been constructed through the changes? It concludes with an examination of national initiatives in the curriculum area.

Professional development (Chapter 4) has been one of the most exciting areas of development for Australian numeracy over the 20 years, and, being more nationally coordinated, the story of changes there raise and reflect the shifting issues and constructions.

Policies or strategies about work and un/employment, competency-based education, and lifelong learning, have shaped the ways in which numeracy education is conceived, made available and taught. The making of adult numeracy has also been shaped by the intersecting educational theories which inform it - from mathematics education, literacy education, adult education and vocational education and training (VET). Adult numeracy owes its existence to these fields, and there remains a need to map out the sometimes competing elements that contribute to the rich debates about the nature of numeracy.

In conclusion, the report briefly examines how these shifting constructions of adult numeracy have contributed to the state of the field today. Are there achievements we should proud of? What are the most urgent gaps to address? What have we learnt from these past twenty years?

Chapter 1

Are Australian adults numerate?

This section will review what evidence exists about the numeracy skills and practices of Australian adults, as well as what evidence is desirable and what evidence is missing. It considers first what we know from surveys, and then asks how we might complement that picture.

Surveys and reports: a measurement approach to numeracy

There have been six surveys over the last twenty-five years that might offer some answers to the question, "Are Australian adults numerate?" Three of them focus on literacy (Goyen, 1977, Wickert, 1989, McLennan, 1996) and three on mathematics (Cockcroft, 1982, Agency, 1997, Bynner and Parsons, 1997); four of them give specific information about Australians, two of them relate only to adults in the UK. If what we are interested in is the distribution of the population into four or five categories from poor to high literacy (including quantitative literacy) skills, then what we learn overall is that there are probably a significant number of people in the lower skills categories. If what we are interested in is the comparison with other countries, then what the surveys tell us overall is that we are not at the bottom, but that we are far from the top. Although we can glean some crumbs about numeracy, we cannot answer the question "Are Australian adults numerate?" There has been no national survey specifically addressing adult numeracy. A new international survey instrument offers us the chance to do so.

Adult illiteracy in Sydney: the Goyen survey

The first survey to provide numerical data aimed to 'obtain an objective estimate of the size of the problem of adult illiteracy' in English in the Sydney metropolitan area (Goyen, 1977, p2). Using 44 questions relating to functional literacy (telephone dialing, housing and job advertisements, and form filling) and a definition of illiteracy as failure on 25% or more of the items, Goyen concluded that 3.7% of the English-language respondents and 43.3% of the non-English language respondents were indeed illiterate. Some questions included numbers, but all were at the level of identifying and reading numbers (from telephone numbers to house prices such as $16,800). Literacy in this survey was assumed to be reading and writing, and clearly did not include numeracy except in this very basic way.

Mathematics counts: the Cockcroft report

This British report (Cockcroft, 1982) also tells us nothing about adult numeracy in Australia, but it was a landmark in its redefining of numeracy, and in the prominence it gave to researching and reporting on 'the mathematical needs of adult life' (Chapter 2 of the report). If the results had been generalisable to Australia, we would be able to say that in 1982, there was a widespread inability to understand and use percentages; reading charts and timetables presented more difficulties than reading maps; one-third of the population had never used calculators; and more than 40% of the population got questions on inflation and reading timetables wrong. Men would have done better overall than women, younger people would have done better than older people (except

in relation to shopping), and people from professional occupations would have done better than people from semi-skilled and unskilled occupations. Interesting coping strategies emerged, including the use of friends and family as mathematical mediators, though lack of skills prevented some people from applying for jobs or training they would have liked to do. It is likely that the situation in Australia was not so different from the one painted by this report. Cockcroft pointed to the unexpectedly widespread 'anxiety, helplessness, fear and even guilt' that activities involving mathematics induced, as one of the most striking results of the investigation, with no link between level of education of the interviewees and the extent to which they used mathematics. The report proposed a definition of numeracy:

> We would wish the word 'numerate' to imply the possession of two attributes. The first of these is an 'at-homeness' with numbers and an ability to make use of mathematical skills which enables an individual to cope with the practical mathematical demands of his everyday life. The second is to have some appreciation and understanding of information which is presented in mathematical terms, for instance in graphs, charts or tables or by reference to percentage increase or decrease. (paragraph 39, p 11)

As Evans (1989) argues, the noteworthy features of this definition of numeracy are its emphasis on confidence and practicality and its critical potential.

"No Single Measure": the Wickert survey

More than a decade after the Goyen survey, the definition of literacy was changing, and with it the tools for measuring it. Adapting them from a 1985 US survey, Wickert .(1989) introduced three literacy dimensions for this small survey based on face-to-face interviews with about 1500 adults. Literacy was defined as:

> Using printed information to function in society, to achieve one's goals, and to develop one's knowledge and potential.

The three dimensions identified were:

> Document literacy: the ability to use and identify information in documents such as forms and memos
>
> Prose literacy: the ability to read and interpret prose in newspaper articles and books
>
> Quantitative literacy: the ability to apply numerical operations to information contained in print material, such as menus. (p 5)

The arbitrary 'single measure' that was used in the earlier study was no longer possible. Also, this time, numbers were explicitly present: reading them (under both document and quantitative dimensions) and operating with them (under quantitative). Mathematics more broadly was not. Successful performance on the quantitative scale required

> [t]he use of mathematical operations such as addition, subtraction, multiplication and division – either singly or in combination – to solve (numerical) problems that are embedded in varying degrees in printed material. (Kirsch and Jungeblut, 1986; cited in Wickert, 1989 p 21)).

And success seemed to be a function of:

- the particular operation called for

- the number of operations needed to perform the task
- the extent to which the task is embedded in printed material (p 21)

There were six tasks, ranging from 'basic' to 'advanced' (Table 1).

Level	This task involved...	% of people correct of those who attempted this item
Basic	totalling two entries on a bank deposit slip	84
Intermediate	account record book	69
Intermediate	a Sydney traveller with an airline schedule	63
Adept	calculating what change there would be from $5 after ordering two items from a lunch menu	62
Adept	A more complex airline schedule	56
Advanced	calculating the cost of a meal at a restaurant, and working out how much extra it would cost on a public holiday when a surcharge of 10% exists	51

*Table 1.*Tasks, levels and correct responses for quantitative literacy dimension.

Thus more than one in ten people were unable to total two items on a bank deposit slip; almost one in three were unable to add two amounts and then calculate change from $5, and only one in two were able to calculate the 10% surcharge.

In the other dimensions of literacy, the percentages of the sample that scored 100% were 14.6% (document) and 21.7% (prose). For the quantitative dimension it was 19%. The proportion of the sample that failed to score at all were 1.2% (document), 6.6% (prose) and 10% on the quantitative dimension. One in ten Australians failed to get any questions correct. The definition of quantitative literacy in the survey is very precise, and is not intended to be the same as numeracy. Elements of what is here seen as document literacy – reading tables and maps, for instance – could be incorporated into a definition of numeracy.

Findings that related to variations in performance on the quantitative scales include (with figures for the document dimension in square brackets):

- Current literacy practice, especially in relation to documents, is the best predictor of the literacy performance of adults
- The 23% of the sample who did not think reading was important in their jobs, scored 17 [11] points lower than the whole sample.
- Those in unskilled occupations scored 26 [15] points lower than the professional group.
- Those living in non-metropolitan areas scored 6 points lower than those living in metropolitan areas.
- The mean score for people of non-English speaking background was 15 [11] points lower than the score for the group as a whole.

- Both younger (18-24 years) and older (55+ years) people of non-English speaking background had a mean score that was close to 20 points lower than the score for the age group as a whole.
- Socio-economic and family health problems as a child correlate with poor performance on all dimensions, but particularly on the quantitative dimension.

Quantitative literacy is clearly a subset of what might be numeracy, and the survey gives us the first glimpse of the needs and performances of Australian adults in relation to numeracy. Wickert sums up the above results:

> It is clear from the results that when people have poor literacy skills, they have even worse numeracy skills. The need to upgrade numeracy skills in the context of literacy must be taken account of in all decisions to raise the levels of adult literacy in Australia. (pxii)

Survey of Aspects of Literacy: IALS and the ABS survey

The next survey to add to our knowledge of Australian adult numeracy was a larger survey which supplied information not only about what adults could do in Australia, but how their performances compared with those of populations in other countries. *The Survey of Aspects of Literacy (SAL)* aimed to:

- identify 'at risk' groups with low literacy and numeracy skills;
- help evaluate literacy and numeracy assistance programs;
- identify barriers to individuals achieving skill levels sufficient for daily life and work; and
- provide statistical support for planning and decision making. (McLennan, 1996 p vii)

According to the survey, the quantitative literacy skills of Australian adults are fairly average.

SAL was the Australian component of an OECD (Organisation for Economic Cooperation and Development) international survey, the International Adult Literacy Survey (IALS) (see OECD, 2000) that studied 20 countries and measured literacy according to whether a person was able to understand and employ printed information in diverse contexts of daily life, a definition similar to the one in *No Single Measure*. It, again, distinguished between three types of literacy defining them as:

Prose literacy

- Prose literacy is the ability to understand and use information from various kinds of prose texts, including texts from newspapers, magazines and brochures.

Document literacy

- Document literacy is the ability to locate and use information contained in materials such as tables, schedules, charts, graphs and maps.

Quantitative literacy

- Quantitative literacy is the ability to perform arithmetic operations using numbers contained in printed texts or documents.

(ABS Aspects of Literacy website; McLennan, 1996 p ix):

It commented that the last type:

> clearly has a strong element of numeracy. However, because quantitative literacy relates to the ability to extract and use numbers from printed texts and documents, for the purposes of the SAL and this publication, it is referred to as a type of literacy. (p ix)

Again, this quantitative literacy is only a subset of numeracy. It omits a range of skills that might be included in some formulations of numeracy. What about tasks not embedded in printed text? What about more complex operations? What about algebra? However, examination of the tasks used to assess the other literacies, especially document literacy, suggests that numeracy is more strongly represented in these tasks than it was in the Wickert survey. Reading and interpreting graphs, charts and tables, spreadsheets and invoices, and making decisions based on the information often involves numeracy skills and knowledge. For example, one of the document literacy tasks was:

> Using a compound interest table, list all the rates that will yield more than $500 interest if $100 is invested for 20 years. (ABS Aspects of Literacy website)

For a task like this, there would be overlap between adults who treated this as a decoding literacy task only, and others who used their understanding of compound interest to inform their reading of the table. Another two tasks involved reading graphs about fireworks, identifying the year of lowest sales, and comparing the information in the graphs about sales and injuries each year. Reading such graphs can involve quite complex understanding of mathematics. For this reason, such questions should be considered in any discussion of numeracy, and therefore it is worth looking at both the document and the quantitative scales.

Sitting in the middle

A comparison of the 20 countries involved, based on the average score for each country on the quantitative literacy scale, shows that Sweden and Poland stand out, the first because of its very high levels of quantitative (and other) literacy, the last because of its very low levels throughout. It has been suggested that Sweden's results could be a reflection of its commitment to lifelong learning for all (ACAL, 1999). Australia is sitting in the middle. In descending order of countries, Australia's score on the quantitative literacy scale:

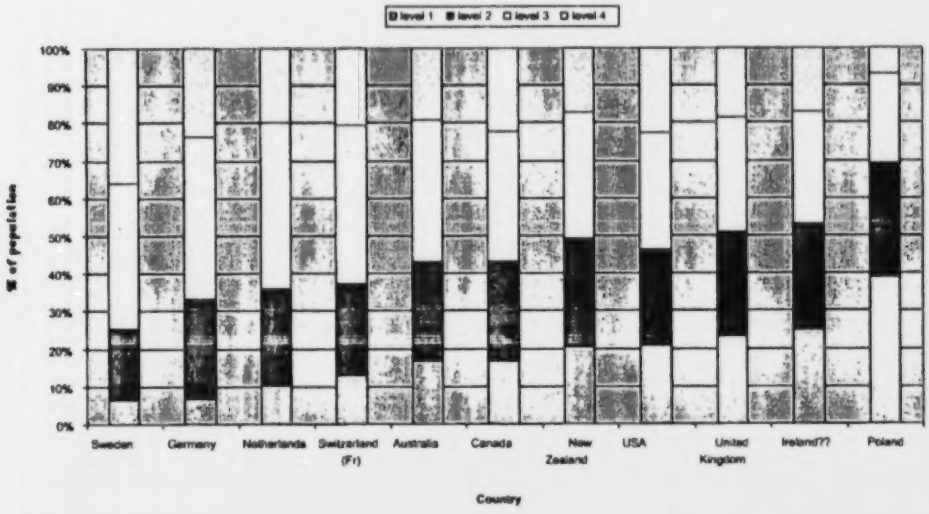
- is significantly lower those of than Sweden, Denmark, the Czech Republic, Norway, Germany, the Netherlands, and Finland
- is more or less the same as those of Belgium (Flanders), Canada, the United States of America and Switzerland
- is significantly higher than those of New Zealand, Hungary, the United Kingdom, Ireland, Slovenia, Poland, Portugal and Chile (OECD, 2000, p 21).

Table 2 gives more detailed information about the scores at different levels in Australia and 10 of the other countries involved. It can be seen that Canada's performance is very similar to Australia's. Approximately one in six Australians is at Level 1, one in four from the United Kingdom, one in 10 from the Netherlands, and one in 15 from Sweden.

	Level 1	*Level 2*	*Level 3*	*Level 4/5*
Sweden	6.6	18.6	39.0	35.8
Germany	6.7	26.6	43.2	23.5
Netherlands	10.3	25.5	44.3	19.9
Switzerland (Fr)	12.9	24.5	42.2	20.4
Australia	16.8	26.5	37.7	19.1
Canada	16.9	26.1	34.8	22.2
New Zealand	20.4	28.9	33.4	17.2
USA	21.0	25.3	31.3	22.5
United Kingdom	23.2	27.8	30.4	18.6
Ireland	25	28	30	17
Poland	39.1	30.1	23.9	6.8

Table 2. Quantitative literacy scale. Comparisons of countries based on percentage of population at each level. (OECD, 2000, p 11; McLennan, 1996 p 12)).

Figure 1: Quantitative literacy skills



Australia is in a similar position on the document literacy scale. Again, in descending order of countries:

- it has a significantly lower score than Sweden, Norway, Denmark, Finland, the Netherlands, Germany, and the Czech Republic
- it has more or less the same score as Canada, Belgium (Flanders), and Switzerland

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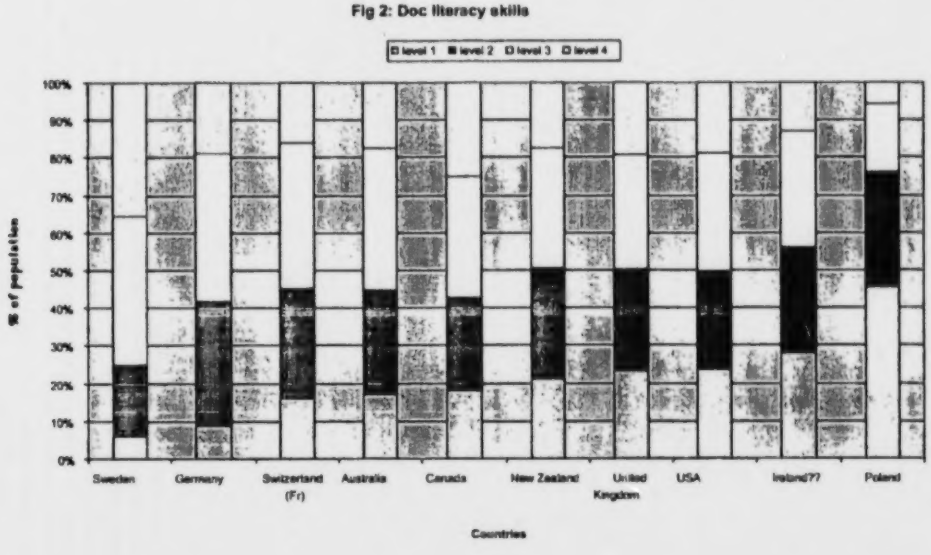
- it has a significantly higher score than New Zealand, the United States, the United Kingdom, Ireland, Hungary, Slovenia, Poland, Portugal and Chile (OECD, 2000, p 20).

Table 3 gives more detailed information about the scores at different levels in Australia and the same 10 countries as in Table 2.

	Level 1	*Level 2*	*Level 3*	*Level 4/5*
Sweden	6.2	18.9	39.4	35.5
Germany	9.0	32.7	39.5	18.9
Switzerland (Fr)	16.2	28.8	38.9	16.0
Australia	17.0	27.8	37.7	17.4
Canada	18.2	24.7	32.1	25.1
New Zealand	21.4	29.2	31.9	17.6
United Kingdom	23.3	27.1	30.5	19.1
USA	23.7	25.9	31.4	19.0
Ireland	28	28	31	13
Poland	45.4	30.7	18.0	5.8

Table 3. Document literacy scale. Comparisons of countries based on percentage of population at each level.(OECD, 2000, p 11; McLennan, 1996 p 12)).



Low numeracy skills

If the IALS survey is to be used to 'identify 'at risk' groups with low literacy and numeracy skills', much can be gleaned.

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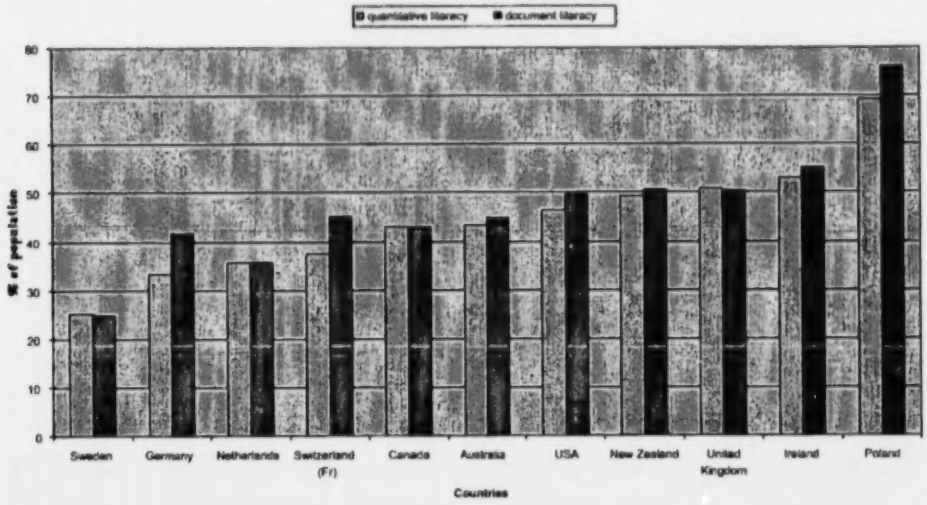
Comparing only the lowest two of the five levels (levels 1 & 2), with 10 other countries gives some useful information. Again Sweden and Poland stand out in both quantitative and document literacies. For quantitative literacy, they are the defining ends of a range from just over 25% to almost 70%. In this range, Australia is again in the middle. Germany, the Netherlands and Switzerland have a little more than one in three people in these two lowest levels. Canada, Australia and the USA have a little less than half their populations in these categories. New Zealand, the United Kingdom, and Ireland have close to or just over half in these categories.

It is worth noting from Table 2, that on the quantitative scale, the proportion of the German and Swedish populations with very poor skills is well below half that of Australia.

	Quantitative literacy	*Document literacy*
Sweden	25.2	24.9
Germany	33.3	41.7
Netherlands	35.8	35.8
Switzerland (French)	37.4	45
Canada	43	42.9
Australia	43.3	44.8
USA	46.3	49.6
New Zealand	49.3	50.6
United Kingdom	51	50.4
Ireland	53	55
Poland	69.2	76.1

Table 4. Comparisons of countries based on total percentage of population at Levels 1 and 2 (Source: Tables 2 and 3 above)

Figure 3: Percentage of total population at levels 1 & 2



If, as McLennan (1996 p 3) argues, people with Level 1 and 2 skills could be expected to experience 'some' or 'considerable' difficulties in using 'printed materials that may be encountered in everyday life', then Australia's 43% of people in those categories translates to something more than 6 million adults who would be able to cope only with difficulty with printed materials involving quantitative or document literacy. About 2.6 million of these are at the lowest level. Who are they?

Indigenous numeracy

The writers of the survey point to important limitations in how the data for the indigenous population can be interpreted: the exclusion of some remote areas, concerns about English-speaking backgrounds, small numbers identifying as Aboriginal. Of those indigenous people represented by the sample almost all reported speaking English as their first language (p 8).

Acknowledging those limitations, the figures comparing the indigenous sample and the whole sample are startlingly different, closer to the Polish figures at the bottom of the scale, but indicating even poorer skills. For the total population one in six is at the lowest level, for the indigenous population it is almost half, with a total of almost three-quarters at the bottom two levels.

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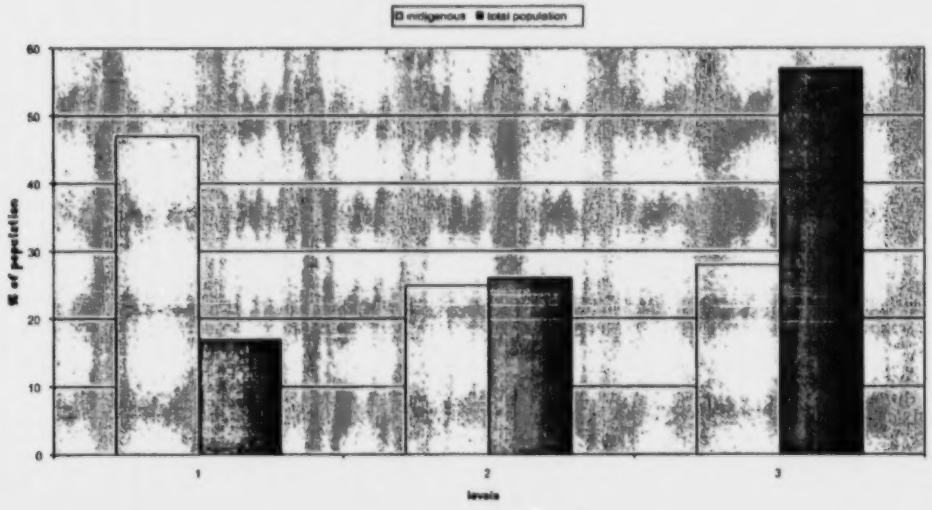
	Quantitative literacy			Document literacy		
	Level 1	*Level 2*	*Level 3, 4 & 5*	*Level 1*	*Level 2*	*Level 3, 4 & 5*
Australian indigenous	47	25	28	45	26	29
Australia overall	17	26	57	17	28	55

Table 5. Quantitative and document literacy scales. Comparisons of indigenous and whole sample results based on percentage of population at each level. (McLennan, 1996 p 12))

Figure 4: Indigenous quantitative literacy



The SAL report points out that this difference may be accounted for by very different educational attainment levels: 62% of indigenous people did not complete the highest level of secondary schooling, whilst the figure for others whose first language was English was 36% (p 8). However, when compared with the Australian overall scores, there is clearly cause for concern: well over twice - almost three times - the number of indigenous people are in the lowest level for quantitative literacy and only half the number of indigenous people are in the three highest skill levels. And although significantly greater proportions of indigenous people were at low literacy levels on all three dimensions compared with the overall figures, the difference was greatest on the quantitative scale.

Gender

While there were larger proportions of women than men at high levels of prose literacy for most age groups (except the 55+year age group), the reverse was true across all age groups for quantitative literacy. Also on the quantitative scale, at Level 1 the proportion of older women was markedly greater than that of older men, 45% of

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women aged 65-74 being at Level 1 compared with 37% of men. However both proportions are considerably more than double the rate for the population as a whole.

Age
Younger people tended to have higher skill levels than older people.

Language
Of people who did not speak English as their first language, 43% were at Level 1, representing approximately one million people. In comparison, of people whose first language was English, 14% were at Level 1, about 1.5 million people. Clearly, although language background is a significant factor, the absolute number of those from English speaking backgrounds is still a significant challenge.

Work
'There was a clear relationship between literacy skill level and labour force status. Depending on the literacy scale, 11% to 12% of employed people were at Level 1. The corresponding percentages for unemployed people were 30% to 31%, and for those who were not in the labour force, the proportions were even larger.'

Towards a picture of Australian adult numeracy

SAL has played a powerful role in providing 'simple, systematic, core information on adult performance on a range of adult literacy tasks'(Cumming, 1997). It established that there are serious concerns about the levels of what it identified and measured as quantitative (and document) literacy amongst Australian adults. Overall there is something like 44% of the population who could be expected to have some difficulty using printed materials related to everyday life. The problem is greater for some groups than for others – indigenous people, women, older people, people unemployed or not in the work force, those from non-English speaking backgrounds. This is the beginning of a picture of Australian adult numeracy.

There are three reasons why *SAL* does not provide a more complete picture of the state of play in adult numeracy: the limitations of the particular study, the limitations of the information it can give about numeracy as opposed to quantitative literacy, and the limitations of information obtainable through surveys in general.

There is a range of concerns about the limitations of the particular study (ACAL, 1999). There were no writing tasks, only reading tasks. Data at higher levels is less likely to be accurate than that at lower levels. The small size of some of the sub-groups make the data unreliable for generalising. Also, because the tasks were developed by Statistics Canada for the first round of testing before Australia became involved, some of the everyday tasks are in forms not familiar in Australian contexts, meaning that the definitions of document and quantitative literacy adopted were not actually operationalised in all the tasks. For example, some of the graphical representations were not common in Australia at the time. All surveys have limitations, and this one had fewer than many literacy surveys, in that it was trying to measure more than simple skills. It was focussing on the use of those skills and trying to get some measure of the way in which people use information in their lives. Treated with caution, such a survey can provide valuable information.

More importantly, there is a danger that the data on quantitative literacy will be seen and used as data on numeracy more generally. However numeracy might be defined, quantitative literacy is a very limited subset of it. Even a functional, basic view of numeracy would probably include 'the ability to perform arithmetic operations using numbers' in real life contexts that did *not* involve texts, as for example in such mental

calculations as estimating the cost of two tickets to the football or ballet. Also as argued earlier, if it is an understanding of numeracy that is being sought, then some of the data from the document scale should also be included in the picture. As Cumming (1997 p 14) points out:

> The *SAL* [quantitative scale] does not provide much information on the numeracy performance of Australian adults, however it does provide information on their ability to work with numbers and simple operations in text.

A more complex understanding of numeracy would be interested in exploring people's ability to use mathematics at whatever level was required in their work or everyday life, and their actual practices in using it. Such a definition might lead to the inclusion of problem solving abilities, knowledge of calculus or statistics, an ability to critique its use, and discovery of social and mathematical strategies.

Even given a definition of numeracy that satisfied more of these concerns however, there is still a third crucial reason why the *SAL* picture provides a very limited picture of adult numeracy in Australia. It is related to the different kinds of information and the different questions that can be explored through quantitative and qualitative methods of research. *IALS* belongs to a discourse where:

> ... literacy skills are elevated; they are viewed as a set of technical skills which, once acquired, usually lead to positive employment outcomes. This 'model' of literacy has been termed 'autonomous' by Street (1993) because literacy is considered a cognitive skill relatively autonomous of social context. ... My approach to literacy and numeracy ... differs from the dominant one outlined above. Rather than focussing on measuring the extent to which different individuals or groups of people possess a particular set of literacy skills, my focus is on what literacy actually means to these people.... This shift from a focus on standardised 'skills' to literacy 'practices' relates to the distinction that Street (1984, 1993) makes between an 'autonomous' model of literacy described briefly earlier, and an 'ideological' model, one based on studies of literacy practices in a range of social contexts and which often bring into focus the central role of power relations. (Black, 2002)

Mary Hamilton (July 2000) takes the argument further:

> We should be doing more to contest the solidifying international "regimes of truth" that are developing through standardised assessment and testing - which are, in their turn, organizing national and local knowledge about what literacy is. Surveys such as the (IALS) International Adult Literacy Survey (OECD 1997) organize our knowledge about literacy and the "literate subject". ... Such surveys increasingly underpin, model, elaborate and justify educational and policy decisions about funding and pedagogy ... [they] draw on a particular discipline - the psychometric measurement tradition - which is dedicated to the search for universal certainties about the relation between literacy, economy and society. They use an information processing model of literacy and attempt to identify levels of literacy skill that are independent of the context of use – the literacy counterpart of the labour skills supposedly possessed by the flexible worker.

The word 'literacy' can be replaced by 'numeracy' without altering the sense of the argument. The surveys have little to do with the numeracy demands experienced by the participants in their everyday contexts, and the focus is often on individual deficit,

and on claims linking the lack of numeracy skills with a range of indicators of social disadvantage: poor parenting, poor education, poor health, poverty, unemployment and crime. According to these arguments, 'objective' surveys measure and give value to particular kinds of numeracy, while devaluing others. Powerful institutions legitimate some numeracies, and ignore others that develop in real world contexts, ignoring too the social networks amongst which these develop. Work by writers such as Lave (1988) and Carraher (1992;1997) point to the gap between formal and informal mathematical practice. In Chapter 2, I will review what we know of such practices in Australia.

International Numeracy Survey: the Basic Skills Agency report

A small scale international survey carried out by Opinion Research Business (ORB) on behalf of the UK Basic Skills Agency (1997) is a perfect example of the approach which views numeracy 'as a set of technical skills ... relatively autonomous of social context' (Black, 2002, above). It compared how well adults in seven countries - the United Kingdom, France, the Netherlands, Sweden, Japan, Denmark and Australia – handled 12 basic numeracy tasks, using pen and paper. In Australia the survey was carried out by the Roy Morgan Research Centre in Melbourne in 1996, and surveyed about 1100 people. The tasks were (Basic Skills Agency, 1997, p 7) :

1. Subtract 1.78 from 5.
2. Take away 2.43 from 5.
3. Add together 5.5, 7.25 and 3.75.
4. The total of 4.25, 6 and 7.74.
5. Multiply 6 x 21.
6. Multiply 16 x 21.
7. Area of a room 11m x 18m.
8. Number of apples each person gets if a box of 72 is shared by six people.
9. Work out 15% of 700.
10. Number of children in a crowd of 7900 if the proportion is 10%.
11. What is 5/6 of 300?
12. Number of books not in the sale if a third are in the sale and the total number of books is 420.

Comparing all the countries, Japan emerged with the best performance, in relation to the proportion of the population getting all questions correct (43%) and the second best in relation to the proportion getting five or fewer correct answers (5%). Respondents in the UK responded least well by a considerable margin (20% getting all 12 right, and 22% getting five or fewer). Australia was second from the bottom on both measures, though significantly above the UK (33% and 14% respectively).

However, unlike the tasks in the SAL/IALS surveys, these tasks are decontextualised to an extraordinary degree, few of them even beginning to recognise the importance of context. The Introduction acknowledges the importance of numeracy 'both in everyday world and in the world of work' (p 5), but the definition of numeracy implied in the tasks is divorced from both those worlds. The knowledge produced

from the survey tells us little of importance about adult numeracy and represents a missed opportunity.

"Does Numeracy Matter?": the Bynner and Parsons survey

The report *Does Numeracy Matter: Evidence from the National Child Development Study on the Impact of Poor Numeracy on Adult Life* (Bynner and Parsons, 1997) again tells us nothing about Australia, except in so far as we may generalise its findings. It did give strong evidence of a link between good literacy and numeracy skills and both the gaining and retaining of employment in the UK. What may be of interest in Australia were two of its challenging findings:

> It is also notable that of the two basic skills, if anything, poor numeracy seems to carry the most significance in these labour market effects. [In addition] women's numeracy performance tends to be weaker than men's, in consequence women appear to be particularly disadvantaged by this lack of competence in an area that seems to be of growing importance in the modern economy. (Bynner, 2002, p 17)

Future possibilities: the Adult Literacy and Lifeskills Survey

Surveys about numeracy can supply us with information and insights, but any survey has pitfalls. What tool is being used to measure numeracy? Does it match the concept of numeracy identified for the project? Even if it does, is the definition adequate? What is being left out or emphasised?

A new definition of numeracy, along with a new tool for measuring it, is emerging from the work being done towards the *Adult Literacy and Lifeskills Survey* (*ALL*)(Educational Testing Service, 2002). A lot of international work and consultation has gone into the definition, including the work of Dave Tout from Australia. It is far more than the quantitative literacy of the earlier surveys, and while the prose literacy dimensions still rely on an information processing model of literacy, numeracy is defined as 'the knowledge and skills to effectively manage the mathematical demands of diverse situations'. The longer, detailed definition (see Appendix 1) clearly owes much to a recognition that skills and knowledge are used and developed in practice.

But will it measure what we want? Because it is to be a standardised measure, and internationally standardised at that, there will be unsatisfactory aspects. It is difficult to find materials that are exactly comparable across countries. Also, the constraints of testing make it likely that, for example, pictures of concrete objects rather than the objects themselves will be used in relation to concepts such as capacity or mass, making the tasks quite different from what they would be in actual everyday contexts.

If the survey is done in Australia (this is not certain at present), and if its results are used with caution, they will add enormously to the little that is known about adult numeracy: the very limited information we have from the IALS/SAL survey about quantitative literacy.

But all such surveys are located more or less within an autonomous model of numeracy (Baker and Street, 1994) and therefore, with their focus on skills and individual deficit, they have absences, in particular, the important absence of social practice.

Chapter 2

What people do: a social practice approach to numeracy

The core element in the shift from a focus on standardised 'skills' to numeracy 'practices' is that numeracy competence and needs:

> ... cannot be understood in terms of absolute levels of skill, but are *relational* concepts, defined by the social and communicative practices with which individuals engage in the various domains of their life world. [This approach] sees numeracy as historically and socially situated. ... The focus shifts from numeracy as deficit or lack, something people haven't got, to the many different ways that people engage with numeracy, recognising difference and diversity and challenging how these differences are valued within our society. [Author's note: I have replaced 'literacy' with 'numeracy' throughout the quote.] (Hamilton, July 2000)

There has been some research done in Australia about what adults actually do by way of making meaning of mathematics in their everyday lives, a beginning to the filling in of the sketchy picture that the surveys have so far provided. A similar understanding of numeracy as practice has informed this research:

> We take practice to be what people do to make their lives, within the constraints of society. We see people as agents, active in making meaning, but not free of social structures, or of particular historical and geographical locations. To explore numeracy in this framework involves teasing out how numeracy practices are 'organised as a going concern'. If, as we assumed, social structures are not given but historically constituted, then there is the possibility that different social interests and constraints may result in different organisations of the practice of numeracy. Rather than an immutable, discrete set of mathematical concepts and skills, numeracy can be seen to consist of multiple practices, shaped in part by broader social activities. The choice of particular procedures to solve a mathematical dilemma in any given situation is influenced by social and cultural factors in the immediate and broader context: by its purpose, by the roles and relationships between participants, by their views about maths and other values. (Johnston et al, 1997)

If support for adult numeracy learning is to take account of the potential of this approach, and respond usefully to the variety of changing social contexts that exist in Australia, then there are a number of questions that need to be explored. They include (Black, 1995, Cossey et al, 1986, RaPAL, 2000):

- Who is numeracy a problem for?
- How can adults be supported as they develop numeracy learning in situated ways and different contexts?
- How can informal ways of learning be used to inform what is taught in more formal contexts?
- How do adults use 'mediators' or networks to support their numeracy practice?
- What do learners perceive as helpful to their learning?

- What are the effects of intergenerational learning?
- How can the impact of numeracy learning on people's everyday lives and on society be identified?
- How can progress be identified, using tools that encompass everyday practice as well as decontextualised skills?
- What do we know about 'what people do' by way making meaning of mathematics in their lives, and how this doing is shaped by broader social structures?

Some of these questions have partial answers already. Others do not. All need more research, some need specific work from teachers and curriculum developers.

Learners

Who is numeracy a problem for?

The SAL results certainly generated a number of categories of people with skills on the bottom levels of the scales. It is possible that these groups do experience problems with numeracy in their lives, as distinct from in paper and pencil and interview test situations, but there is little evidence that this is so, and if so what sort of problems they are. Black (2002) cites a number of studies of groups where employers or government agencies prescribe literacy upgrading, while failing to see and acknowledge practices that are perfectly appropriate to the work or everyday context of the participants. He argues that literacy classes for the unemployed do not necessarily lead to employment, and that the undeniable relationship between literacy and numeracy levels and employment status is not necessarily a causal one. He argues that:

> ... it is precisely this poor economic climate that encourages a focus on lack of skills, because in doing so, responsibility for the problem of unemployment shifts to those who can be identified as having a literacy [numeracy] problem. (p 10)

The argument could well hold for numeracy, but there is little sustained evidence. There is a need for research that teases out the different numeracy needs of communities, workers, and employers. Buckingham (1998) and Lukin (1998), below, bring some evidence of what these might be.

Learners' perceptions

What do learners perceive as helpful to their learning? In the mathematics education literature in general, much attention is paid to learners' perceptions - attitudes and feelings, understandings of the nature of maths - in the recognition that these affect learning. In Australia, research on what adults learners perceive as helpful has made a useful beginning, including work such as that on language (Marr, 2000), attitudes to authority (Webber, 1998) and the influence of gendered discursive practices (Saunders, 1998).

Mediators

How do adults use 'mediators' or networks to support their numeracy practice? In the research relating to literacy practices, both Baynham and Masing (1997) and Black (2002) point to the importance of mediators and social networks. Some indication of a similar use of mediators in banking and job seeker situations emerged in a study on the numeracy practices of young unemployed people (Johnston et al, 1997). More

knowledge of these relationships would enhance our understanding of what it is that particular groups of people need to know, and whether all people need to know all of it.

Intergenerational learning

What are the effects of intergenerational learning? The surveys point to the intergenerational influence on skills in terms of deficit – illness, poverty, lack of reading materials. We have little or no knowledge of adults' learning in relation to either their parents' or children's generation. One exception is the work being done by Brew (2000) looking at mothers returning to study maths at TAFE, and finding a positive relationship between the work of the mothers and their children. A project that has been very successful in the USA, and with spin-offs in Australia, has been the Family Maths project (Cossey et al, 1986). In its original form, it was developed for community groups with little access to education and relied on the idea that many parents would like to help their children with maths but did not know how to begin or what to do. The project allowed the adults and children in a family or community to enjoy doing maths together, and to become more numerate by learning how to use that maths in meaningful social contexts. It has been shown in similar programs used with disadvantaged groups of students abroad that both the adults and the young people benefit in the short and long term from such opportunities. As well as teaching 'school' maths, such projects could also explore and try to address the numeracy needs specific to the community.

What people 'do'

What do we know about 'what people do' by way making meaning of mathematics in their lives, and how this 'doing' is shaped by broader social structures? Many of the people who may want or need to become more numerate are already more numerate than they recognise, research having indicated that a large number of people are not aware of when they are using mathematical skills and knowledge (Coben and Thumpston, 1994). What is needed is in-depth research about what knowledge and needs people actually have in their everyday and working lives. The work of Buckingham (1998) makes an important beginning, examining the ways in which workers' learning and practice of numeracy are shaped by the management models in which they find themselves operating. Carmody (1998) shows, in a very different workplace, how practices of maths and gender intersect in a mother's life with a young baby. Zevenbergen (1995) examines the 'situated numeracy of pool builders'. The study of young unemployed people mentioned above (Baynham, 1998) gives some insight into what the young people knew and did, and how they were constrained - or enabled - by gender, dis/ability, culture and (lack of) wealth. A study of young Aboriginal children by Kearins (1991) has shown how knowledge about number and space is shaped by culture. Is this shaping evident in the understanding of older people? Again these are interesting beginnings, but even these have not been mined for what they could tell us about supporting adult learning.

Teachers

Supporting learning

How can adults be supported as they develop numeracy learning in situated ways and different contexts? Lee, Chapman and Roe (1993) undertook an important project that addressed part of this question: 'What are adult educators to do with the mathematics

that occur in the social tasks and texts encountered by adult learners across an increasingly diverse range of educational contexts and programs?' Their carefully argued report draws on a wide theoretical discussion, and a range of investigations of classroom-based practices, and its insights have hardly begun to touch the field. Helme (1994) has investigated 'the role of task context on performance, task perceptions and the solution methods of adult women students'. Some of the situated learning that must go on is in workplace contexts, and several studies reveal that 'quite complex, context-specific' mathematics is frequently carried out by workers (Deakin, 1995). How is this learnt? Lukin (1998) in her challenging study on safety procedures in the coal industry, argues that it is not enough to 'contextualise' maths in terms of the learner's everyday personal contexts. The abstractness of maths, working as a tool to construct reality, is crucial to its power as a model for critical decision making, and it cannot be ignored with impunity. 'Contextualising' (in this context) must include an understanding of the nature of the abstract tool involved, and how it is used to manage the context.

Drawing on informal learning

How can informal ways of learning be used to inform what is taught in more formal contexts? An excellent project in the schools sector - *Rich interpretations and understandings of mathematical ideas and techniques* (RIUMIT) (AAMT, 1997)– could well be used, and paralleled in the adult sector. Its aim was to examine how people used mathematics in a variety of workplaces and school settings. *Numeracy on the Line* (Marr et al., 1994) is a teaching package that emerged from research into workplace practices in the automotive industry. In addition, many of the studies of practice already mentioned (Buckingham, 1997, Johnston, 1998, Lee et al, 1993, Lukin, 1998, Saunders, 1998, Webber, 1998) contain explicit implications for teachers.

Identifying progress

How can progress be identified, using tools that include everyday practice as well as skill type tests? The numeracy measurement tool involved in the Adult Literacy and Lifeskills (ALL) survey discussed in Chapter 1 may be able to give some idea of 'progress'. So perhaps may the National Reporting System (NRS) currently in use, given its wide and eclectic theoretical framework, including, according to the NRS website:

> activity theory, genre theory and Systemic Functional Linguistics, critical linguistics, critical literacy pedagogy and theories of task and text complexity, adult learning, constructivism, critical constructivism, second language acquisition and assessment. (ANTA, 1995)

Starting from a numeracy practice framework however, we would want to identify what the practices were that were crucial to the participants, and then to chart how these might be achieved, and not necessarily by each individual. It might be sufficient for the relevant group to contain within it the skills needed for that group - family, work group, peer group – to carry out the activities it saw as necessary. Black's work on literacy practices is a good model to start from (Black, 2002).

Impact of learning

How can the impact of numeracy learning on people's everyday lives and on society be identified? An assumption that becoming more numerate is important must be based on a presumption that increased numerateness has benefits for both individuals

and communities. What evidence is there for this assumption? What benefits can be identified? Who benefits from workers' increased numeracy, and what kind of numeracy is relevant? It is important to understand the numeracy practices of people without an 'at-homeness' with maths (Cockcroft, 1982), so that they can increase the power of their input into decision making. Yasukawa (1994) argues that mathematics can be abused, as well as used and that therefore it is equally important to understand the practices of engineers and others who use mathematics in powerful ways to shape society. It is important for the powerful, as well as the less powerful, to be able to use mathematics critically – it is important that both are, in this sense, numerate.

Conclusion

So what do we know about Australian's engagement with adult numeracy? From an autonomous view of numeracy as a set of skills, the surveys tell us that when interviewed and tested in doing more or less out of context tasks, Australians are better at this rather limited 'quantitative literacy' than the populations of some countries, and worse than others: Australia is somewhere near the middle of the industrialised countries included in the surveys. The surveys tell us that there are specific groups – including older people, people of non-English speaking background, indigenous people, unemployed people – who have lower skills than the average for Australia.

When we shift to a practice-based view of numeracy engagement, we find the beginnings of a rich resource of research and pedagogy to draw on for increasing adult numeracy competence in the workplace and wider community. Analysis of Australian numeracy practices is beginning to provide practical guidelines, to develop models of good practice and to raise important social and theoretical questions about the relations between numeracy, literacy, mathematics and power.

Questions remain: who needs numeracy? What are good ways to become numerate?

Chapter 3

Addressing perceived needs: curricula

Historically it is interesting to see how the Australian field responded to the needs of its numeracy learners, and teachers. A search back through twenty years of journals in the adult literacy and numeracy field - eg Literacy Broadsheet, Literacy Exchange (now, Literacy and Numeracy Exchange), Open Letter (now, Literacy and Numeracy Studies), ARIS (Adult Education Resources and Information Services) Bulletin - shows a clear progression of concerns. First, it is numeracy classes themselves which are new and a matter for debate and discussion. The interest then shifts to an increasing range of specially created teaching and learning materials, some of which are now internationally recognised and used. Teacher professional development is the next focus, beginning with short half-day courses, and developing into 12 hour, and later into 80 hour courses. The latest concern has been that of developing appropriate monitoring and assessment procedures and materials. From time to time over the twenty years, supportive groups of teachers were formed. There is not much explicit discussion of numeracy curricula, perhaps because these were almost always tied closely to developments in literacy curricula, and implicit in discussions about these. It is one of the difficulties of tracing the history of developments in adult numeracy, that its conflation with literacy leaves a silence. This chapter will address the way in which numeracy curricula changed during this period.

The story of numeracy, or maths, curricula for adults in NSW TAFE can be seen as a spiral that is echoed , with important variations, by other providers and in other states. It moves from a trade setting out into the community, then returns, with some of its community shaping, to the VET sector. It began as tutorial support for trade courses. It widened to include, and then focus on, second-chance learners from the community by establishing a range of classes open to anybody. The structure of these classes expanded, articulating into an accredited certificate in adult basic education. Gradually moves were made to connect the certificate more closely with VET, until, at this moment, the certificate is explicitly named and organised to include vocational education. Students on the Federal Government's obligatory Literacy and Numeracy Training program (LANT) for unemployed young people have attended courses at TAFE, though often it is organisations in the community or private sector who have won the tenders for these courses. (The program has been changed to incorporate English Language programs as well, and from 2002 has become the Language, Literacy and Numeracy Program (LLNP)) In the following section, the NSW story is told in some detail as a prelude to linking it with the stories from other states and territories. The chapter concludes with a brief view of national curriculum trends.

Data for this chapter, especially the NSW data, was obtained where possible from curriculum documents. Additional data was obtained in face-to-face interviews with two NSW practitioners, and fifteen telephone interviews, using a structured questionnaire (Appendix 1). At least one, often two, experienced numeracy practitioners were interviewed from each state and territory. As always in the numeracy story, it has been difficult to tease out all the developments, and the following account leaves out much, firstly for reasons of space, and secondly because of the necessary limitations of particular individual accounts.

The NSW story

Early TAFE courses

Remedial maths

In a search for curricula used to teach mathematics to adults during the last 20 years, the earliest identified was a TAFE course called 'Remedial maths' in the early to mid-1980s, though it is likely there were earlier versions. No details of its contents or parameters were available. It is only in juxtaposition to the following curriculum, approved to begin in 1987, and now called 'Refresher Maths', that it is possible to guess at the shape of the early curriculum.

Refresher Maths
(starting in 1987) was intended to service students with numeracy difficulties in other TAFE courses. It emphasised underlying concepts, and covered problem solving as well as computational, spatial and estimation skills. It was taught by vocational or trade subject teachers with the help of an ABE teacher, and in some cases volunteer tutors were used.

Maths Workshop
was introduced as a parallel course in 1989 and continues to this day. It reflected a shift from servicing of TAFE vocational courses only, to addressing general second-chance adult numeracy needs. It was (is) student-centred, activity-based, using structured materials and negotiated content and assessment, and sometimes no formal assessment at all. It was taught by ABE teachers, or General Education teachers with specific professional development.

The Certificate of Adult Basic Education (CABE)
This certificate began in 1988 and CABE Maths I and Maths Workshop were parallel provisions catering to different target groups, the first a second-chance education group, the second a group where an entry test for selection was used. The groups were differentiated by learner goals and needs, affective factors, learning and study skills. CABE Maths 1 (written by Jeannette Thiering and Anne McRae) articulated into Maths 2, which was not part of CABE, but part of the Certificate of General Education (CGE), an indication of the increasing value attached to articulation. The course was topic and skills-based, and the content of the curriculum was outlined in detail, with suggested activities and resources, somewhat parallel to a primary-school curriculum. It – and later curricula – were more than the skills set out because of the recommended adult teaching methods which included negotiation, recognition of learner goals, and an emphasis on 'learning to learn'.

Later TAFE courses

Certificate of Adult Foundational Education (CAFE)
In 1995, CABE was up for re-accreditation, and the shift to the new course was considerable. Firstly, in a serious response to the generally prevalent competency agenda, and the specific *National Framework of Competence in Language, Literacy and Numeracy* (Cope et al., 1993), Foundation Studies Division of TAFE put two years into developing a new certificate (Kristine Highet, Edd Ashmore and Don Colless were instrumental in developing the maths components). For both literacy and numeracy CAFE used the broadest possible statements of competency, with responsibility for interpretation and specific content devolving on the teachers. The proposed outcomes were very general, and included affective, and learning to learn, as

well as generic literacy and numeracy outcomes. The use of the *Framework* also resulted in the incorporation of two of its three levels of learning (assisted and independent) into the curriculum (the third level, collaborative, was considered too high-level for CAFE).

Secondly, the course was longer than previous certificates, and contained 4 levels providing enough hours for a total of 4 semesters of full time study. It was felt that certain student groups, for example indigenous students who made up 25% of the student population and were the largest single group of students outside the Metropolitan area, needed a longer course. CABE had allowed only the equivalent of 1 semester of full time study.

Thirdly, the document made the radical claim that numeracy and literacy were inextricably linked, and followed it up with expectations that teachers would put this into practice. CAFE no longer had a specific maths content, but embedded literacy and numeracy requirements into all subjects, structurally forcing the integration of literacy and numeracy. Integration thus bred a focus on context and practice. As in CABE, an adult teaching approach was a central element. Negotiation was core, in relation to content as well as order or level or context. Teachers negotiated with students and could choose to focus on almost anything, thus opening up the curriculum enormously from the explicit step-by-step approach of CABE.

The longer course with its more negotiated approach opened up the content and fostered new ideas. The development of accompanying resources for integrated as well as separate iteracy and numeracy units of work followed. However, teachers found dilemmas in adjusting. The integration of literacy and numeracy, and the lack of specific content for teaching and assessment procedures, made it difficult for some teachers to assess and plot student progress. For many teachers, it was content knowledge inherited from working with the more prescriptive CABE that gave them the experience to cope with this more open curriculum, although it was that very prescriptiveness that caused problems.

Essential qualifications for teachers specified a degree or diploma including studies relevant to teaching numeracy in ABE. Relevant postgraduate qualifications and experience teaching adults were seen to be desirable.

Foundation and Vocational Education (FAVE)

In 2001, CAFE was needing re-accreditation, and this was taken as an opportunity to revamp the whole course. The name of the course indicates the shift towards VET that it facilitates. There was a new student group to be encouraged into ABE: those not suitable for school programs but of post-compulsory school age or very young adults. It would seem also that this may well have been at the cost of the more traditional target groups eg Koories and older people especially post retirement. Literacy and numeracy have been split back into their separate strands, partly it seems in response to teacher reactions to CAFE (Hazell, 1998) and ABE is located more strongly in the General Education field. For the first time for some years, responsibility for numeracy seems to have been returned to 'mathematics' under General Education. In its focus on content, it is a return to the CABE curriculum, and similar to the Victorian CGEA with its specific learning outcomes. The core includes learning to learn, computer literacy, and language (ie English as a second language), as well as literacy and numeracy, and the course is structured into modules which can be completed separately, giving a clearer picture of what has been done and a better completion rate. A question that is not yet answered is whether the FAVE documents have

retained enough of the good numeracy practice of the past: adult learning principles and pedagogy, learning to learn processes, critical numeracy, the relations of numeracy to literacy and language. Teachers accustomed to working with the more open CAFE documents may be able to fill some gaps for themselves. New teachers may not be so lucky.

Teacher qualifications are spelt out in some detail. There are criteria listed under each of the three headings: teacher competencies, vocational qualifications and industry experience. A degree or diploma including studies relevant to numeracy or a related discipline is essential as a vocational qualification. Teacher competencies include a degree or diploma in education, but lesser teaching competencies such as the Certificate IV in Workplace Training and Assessment are seen as adequate alternatives.

Courses offered by other providers

Three other major providers in NSW that developed or used numeracy curricula over the last fifteen years were the Adult and Community Education sector (ACE), the Adult Migrant Education Service (AMES) and the prisons, under their education body, the Adult Education and Vocational Training Institute (AEVTI). Mission Australia, other church groups, and private providers (eg Australian College of Language (ACL)) also offer/ed some numeracy courses. One particular client group for this some providers consists of those obliged to enrol in Literacy and Numeracy Programmes (LANT) or Language, Literacy and Numeracy Programs (LLNP) under the Federal Governments 'Mutual Obligation' Scheme for young, or not-so-young unemployed people.

Centre-based courses

Both ACE and prison courses address the needs of students with disrupted schooling and work experience, ACE courses focussing on students from the community looking for a first step back into education. Initially funding for community education allowed each ACE centre to develop its own programs, usually built on material from TAFE's Adult Literacy Information Office (ALIO). They were non-accredited, non-articulating courses with no cross-crediting to other educational organisations and programs. A similar situation existed in the prison context, where the individual programs had to be approved only by Head Office.

Certificate of General Education for Adults (CGEA)

In 1994 however the prison sector created AEVTI, its own Registered Training Organisation (RTO). As part of its strategy to reduce recidivism, and to create 'safe and humane containment' the Corrective Services Department emphasised the need for programs for psychological development, employment and education opportunities. One aspect of the education and employment focus was seen to be the need for accredited programs, that articulated nationally and were recognised by employers. The curriculum framework AVETI chose to meet these needs was the Victorian CGEA. Factors influencing this choice included the fact that the CGEA's audience consists of students with similarly disrupted schooling experiences, and its framework is non-prescriptive allowing teachers discretion in what and how they teach. It encourages teachers to integrate literacy and numeracy, and to contextualise learning, making it relevant to experience and needs wherever possible. It has general

articulation into the Australian Quality Training Framework (AQTF)[1], and is used in SA, WA and NT. (In Victoria, the prisons work through TAFE). Above all, for the Corrective Services Department, the CGEA is flexible, and as the core program in all jails, addresses the needs of a mobile population. It has just been re-accredited, and because it now goes to Certificate III, not just Certificate II as it did previously, when inmates get out of jail, they can enrol immediately in the important employment-related Certificate IV courses, or in training packages.

In1997, the Australian National Training Authority (ANTA) acknowledged that as well as TAFE, ACE in NSW had the capacity to deliver accredited programs and that in fact there was a good opportunity to strengthen the pathway opportunities between ACE and TAFE if complementary VET delivery was available across the state. .ACE thus became eligible for VET funding from ANTA and was expected to offer accredited courses. It too chose the CGEA as its curriculum framework. Students enrolling in ACE courses tend to be using them as a first step back into education after long break away. They are wanting to improve literacy and numeracy as well as make some vocational headway, and they seem to prefer a short time commitment each week, allowing the involvement to stretch over a longer period. Many of them are using the courses as a pathway to more formal involvement in TAFE courses. Like AVETI, ACE saw the CGEA as addressing the needs of these students. The NSW CAFE was also directed at this group, but ACE needed an umbrella licence for its 60 providers, and the license for TAFE curricula was at that time expensive. (Now licences are on Crown Copyright and are much cheaper.) The CGEA on the other hand was free, so long as conditions about professional development, moderation and teacher qualifications were met, and ACE provided funds to local and regional coordinators to ensure this. Other attractive features were the flexibility of the course in relation to the time taken to finish it, and to the general VET curriculum options available, and the fact that it was shorter than the comparable TAFE course. Initial problems with credit transfer to TAFE were clarified in 2001.

More detailed information will be given about the CGEA, a Victorian curriculum, when we review the curricula offered in other states.

Certificates I, II and III in Literacy and Numeracy

In 1993, NSW AMES won one of the early tenders for the provision of literacy and numeracy in large number of Special Intervention Programs (SIP), a government funded program to assist disadvantaged job seekers overcome barriers to employment. Over the next two years they worked in consultation with other numeracy practitioners on a numeracy subject, and in 1995 the new Certificates I and II in Literacy and Numeracy were accredited. The Certificates have a prevocational emphasis, with Certificate 1 beginning with pre-literate students. They incorporate an adult education approach and use a social approach to mathematics understanding, seeing maths, like language, as a social activity. Unsurprisingly, the modules are informed by a strong consciousness of how language is used. Teachers involved in delivery are required to have specialist professional development qualifications.

Out of this initiative came other developments. AMES's main course, the Certificate in Spoken and Written English (CSWE) was adapted to include a numeracy strand, and a handbook and a workbook were developed for teachers (Lukin and Ross, 1996;

[1] The AQTF was developed by the Australian National Training Authority (ANTA) with its key objective being to provide for a nationally consistent, high quality vocational and training system. (www.anta.gov.au/aqtfWhat.asp)

Ross, 1996), books that have sold well beyond the adult sector. As well as the books being used in schools, the Certificates themselves are offered in some schools, particularly in the Intensive Language Centres and their feeder schools.

When the huge tender for the SIP programs was lost a few years later in the lottery of tendering, AMES won instead a tender related to the Literacy and Numeracy Program (LANT), another program for young unemployed people. This tender involved the delivery of distance programs, and AMES developed materials specifically for indigenous students. This tender has now been lost to the distance branch of DET NSW, the Open Training and Education Network (OTEN) of TAFE. A project using the Certificates, and assisting in the development of local materials has been running at Batchelor College of Indigenous Training in the Northern Territory.

Bridging courses and academic numeracy

Another area where much work related to adults learning maths has been and is currently being done is that of bridging courses in mathematics for entry to, or support in, some university subjects (Chapman, 1998). Teachers are required to have a certain standard of mathematics, nurses and engineers and graphic designers are amongst the many who need some maths: whether this is numeracy is a question that occupies much discussion. It is a fascinating area , but not one that will be addressed in this review.

Other states and other courses

How does this account tally with developments in other states? Using the responses to the questionnaire (Appendix 1) this section looks at providers and curricula, and some of the factors involved in the changes and differences.

Providers

It is difficult in Australia when talking to colleagues from other states to be sure that everyone is using language in the same way, and this report has found the same difficulty. TAFE for instance refers to somewhat different structures in NSW where it is a centrally supported, public institution, and Victoria, where some TAFE institutes or colleges exist as independent businesses. Nevertheless, answers to the first question "What institutions or organisations in your state offer or have offered adult numeracy courses over the last 20 or so years?" give a rich picture of the players.

All states named as providers of numeracy courses TAFEs or Technology Institutes, community based programs, prisons and more recently private providers of all sorts, particularly those involved in delivering LANT programs. SkillShare and AMES were frequently included. In many states, church bodies (eg Mission Australia in NSW, Nungalinya College in Darwin and Colony 47 in Tasmania) have been active in offering LANT and other literacy and numeracy programs. In Victoria, NSW and the ACT schools have been, in particular circumstances, providers of (adult) numeracy courses or tutoring. In most states much of the early work, including home tutoring (eg in Tasmania), was done through TAFE and ACE and carried out by volunteers and this is still the case in some states (eg SA).

The picture in the NT is rather different from that in most of the other states and territories. Like the others, there are TAFE type courses, WELL programs, and prison courses. There have been SIP courses. Because of its large indigenous population, and remote area needs, Batchelor College of Indigenous Training , Centralian College in

Alice Springs and Nungalinya College in Darwin provide numeracy courses, and outreach access as well, as do missions in remote areas. OTEN in Sydney and a Perth group provide additional distance access.

As funding for the sector diminished, and accreditation of other courses increased, there has been a perceptible shift from the numerous courses offered by community groups towards an emphasis on VET. In most states and territories, Workplace English Language and Literacy (WELL) programs have been offered by business and other workplaces, sometimes in partnerships with TAFE, community organisations and private providers. There is a danger that numeracy (and literacy) programs will be merged so successfully into the VET agenda - that they will be so 'vetted' - that they will not be visible at the grassroots, to the very people who most need them.

Programs/courses

Like NSW, most other states and territories began their adult numeracy provision in the mid to late 1970s with remedial, or later, 'refresher', courses for eg apprentices, nurses, and unemployed youth. Community organisations offered numeracy courses free or at minimal costs to on such topics as 'helping with homework' (Tasmania), 'Maths for mothers' (NSW), 'returning to work' (WA). Most of these courses had no specific content, but addressed what seemed necessary at the time. Some of them mirrored school maths, others were more contextually based.

In the late 1980s more formally based courses with explicit aims, student target groups, content, and teacher qualifications began to emerge, and there was a push towards nationally accredited courses and articulation into further education. By the mid-1990s all states and territories had an accredited course or courses which included a substantial numeracy strand. Some states/territories included a focus on indigenous education or on distance provision.

Victoria

Early courses in Victoria included several with few or no curriculum guidelines, relying for the most part on student need and negotiation, and sometimes using one-one teaching. These were usually free, and often courses with specific target groups: youth with intellectual disabilities, preparation for work groups, women's groups.

The Certificate in General Education for Adults (CGEA)

With the further education sector support for national accreditation of courses, the Certificates were developed and accredited in about 1992. They have been twice revised, and now constitute a nationally accredited, competency-based curriculum framework that is probably the most widely used in Australia. Their student target group is those doing adult basic education but the framework is flexible enough to be adapted for workplace and vocational students as well. It has been taken up by community and further education sectors in NSW, WA and the NT, as well as corrective services in several states and territories, including SA, WA, NSW and Victoria. The reasons for its popularity with corrective services was described in one report:

> The CGEA has the flexibility to allow for the issuing of a Statement of Attainment at regular intervals, which is an easier initial achievement for prisoners, compared to that provided in other systems and is able to provide for the development of basic competencies, described as the Mayer competencies, which meet employment needs. There has been

> considerable growth in the number of prisoners enrolling in modules within the CGEA program. (SA Department of Corrective Services, 1997)

The earliest version of the numeracy strand was topic-based, rather like school maths, starting from the content rather than the student. Later revisions made significant changes. Both earlier and later versions of the CGEA have contained 4 levels, giving, in the latest version (see NRS website: www.nrs.detya.gov.au/nrs/index.htm for meaning of NRS levels):

Level 1	NRS 1	Certificate I GEA (Introductory)
Level 2	NRS 2/3/4	Certificate I GEA
Level 3	NRS 2/3/4	Certificate II GEA
Level 4	NRS 4	Certificate III GEA

The numeracy component of the CGEA is developed from the view that numeracy is about making meaning of mathematics and it presents a set of learning outcomes in keeping with this view. It sees numeracy as an important tool in life and as a subject for study in its own right at the upper levels. The CGEA documents describe process and context and do not prescribe content which is seen as something that should respond to student need and interest. In the earlier version (prior to 2002), numeracy was a core subject at the first two levels only. In the more recent restructuring, numeracy is core at level 3 (CGEA II) as well, and the demand from the VET sector for more flexibility was addressed. Teachers teaching on the course are required to have a teaching qualification, and at Level 4, they are required to be trained maths teachers. The curriculum document itself also acts as a professional development tool, including a large amount of background documentation. This is seen as to some extent making up for a chronic lack of system professional development.

Ideas from the literacy genre movement and from theories of literacy as practice, have informed the concept of numeracy as it appears in the CGEA. Because the course is widely used in Australia it is worth quoting here at some length from an article by Tout and Schmidt where they describe the course and its orientation for an American audience (2002):

> Rather than organizing learning outcomes in the traditional fashion (in accordance with the standard areas of school math education - number and operation, geometry, data analysis and probability, measurement, and algebra - as described in many school curricula), the CGEA organizes outcomes around the purpose and use of mathematics in social contexts. These outcomes are organized into four different categories, or domains (referred to as different numeracies), across four different levels of student development:

- *Numeracy for practical purposes* concerns aspects of the physical world that have to do with designing, making, and measuring. There are two learning outcomes: *design* (e.g., recognizing and using shapes in packaging, buildings, art, etc.) and *measurement* (e.g., in cooking, making furniture, etc.).
- *Numeracy for interpreting society* concerns interpreting and reflecting on numerical and graphical or statistical information of relevance to self, work, or community. The two learning outcomes are *data* (e.g., graphs and statistics of consumer prices, sporting event scores, etc.) and *numerical*

information (e.g., information on financial transactions from banks, newspaper articles, etc.).

- *Numeracy for personal organization* focuses on personal situations and interactions involving money, time, and travel. There are two learning outcomes, one dealing with money and time, the other with location and direction.

- *Numeracy for knowledge* is introduced only at level 3 of the four-level CGEA curriculum framework and deals with the skills needed for further study in mathematics or in other areas of study that require an understanding of math. Learning outcomes focus on problem solving and algebraic and graphical techniques. At this level adults begin to learn (or relearn) the formal aspects of mathematics.

  Within the individual CGEA learning outcomes themselves, the assessment criteria that need to be met by students are broken down into three subcategories: mathematical knowledge and techniques, language, and interpretation. Even at this level of detail the emphasis is not only on mathematical skills but on the skills of communicating about the mathematics involved in problems and interpreting the solutions.

  Consequences follow from this way of designing curriculum standards. First is the actual importance of mathematics. The CGEA states that numeracy is about using maths for some particular social purpose within a certain context, and the implication is that mathematics is an important, useful, and vital tool in contemporary society. It also acknowledges that formal mathematics has its place, at least as a pathway to further study, through the fourth category of learning outcomes, 'numeracy for knowledge'. Second, the CGEA encourages the teaching of numeracy in a holistic, integrated way, and literacy and numeracy are often taught together. For numeracy teachers who do not have formal training in maths, the CGEA learning outcomes are easier to understand and work with than the traditional school-based mathematics curriculum (Ciancone and Tout, 2000).

  [In addition the CGEA] curriculum is based on teaching in a context. In such environments, teaching becomes task-oriented - that is, it involves engaging students in problem solving via investigations or projects involving 'real life' mathematics. Teachers develop realistic tasks or investigations that are of interest to the students, and students then go about solving the problems posed. The mathematics skills that are taught arise out of the tasks being investigated. One consequence of this arrangement is that classes engage in whole group, small group, and individual work, and this is also how the math skills are learned and practised. Another consequence is that conventional textbooks do not really suit this approach. The learning involved requires students to work actively on projects or investigations, not to work their way through a sequence of sums or word problems in a book. The assessment that tends to follow from this approach is not test-based. (p214-215)

Tasmania

Basic maths classes have available for adults since the 1970s. Volunteer home tutors were involved, and programs were free or very cheap. Most of the maths, even at the level of Year 10 was very contextualised, and thee have been a number of WELL and other workplace programs involving numeracy.

Australian Capital Territory (ACT)

By the end of the 1970s, the ACT had a course in numeracy, remedial maths for community members. Accreditation was seen by seen by some teachers at this point to be a hindrance to learning rather than the unproblematical good that it has since become, something that might affect the student based approach. Thus there was no set content for the courses.

Other broad courses based around student needs developed through the 1980s and early 1990s. Literacy and Numeracy for Adults (LANFA) was one of these, a certificate course, with the option of a statement of attainment also. It tried to address a wide range of students at different levels, and found the process somewhat unwieldy. The Certificate in Adult General Education (CAGE) was another, a year 10 equivalent course, whose focus was on students gaining a feel for numeracy, linking it to life and enjoying it.

Certificates in Learning Options

In 2001 this new course was accredited. It will have 3 levels of Certificate and a statement of attainment awarded for 3 modules at any level.

1st level	NRS 2	Certificate I
2nd level	NRS 3	Certificate II
3rd level	NRS 4	Certificate III (currently being developed)

The course includes modules on language, literacy and numeracy as well as modules on computers, the Internet, workplace awareness, work preparation, interpersonal skills, and the individual in the community. It allows for a taster subject and credit for vocational courses eg in hospitality and horticulture, and it aims to improve students' literacy and numeracy, while preparing them for further vocational training, or employment.

Certificate in Adult General Education

In 1994 this course became self paced and since then it has gone online. Although the old text has been rewritten, the course is still fairly formal, allowing some negotiation for students, though not in relation to content. Students need to develop good management skills for learning. It gives a qualification equivalent to Year 10.

South Australia

It was the late 1980s in South Australia when the Introductory Vocational Education Certificate (IVEC) for second-chance education was first offered in TAFE, and the Certificate in Preparatory Education (CPE) for adult literacy and early school leavers was available in the ACE sector at about the same time. They have both been delivered face to face, externally and, now, on-line. LANT, Women's Only Program, ACE, and low-level students at schools – all use maths subjects from the CPE. LANT also uses IVEC subjects.

Certificate in Preparatory Education (CPE)
has evolved and developed over the last ten years. It is seen to be at Australian Qualifications Framework (AQF)[2] Level 1, and contains a substantial numeracy component.

Introductory Vocational Education Certificate (IVEC)
is at AQF Level 2 (equivalent to Year 10 or 11) and contains work on decimals, fractions percentages, extension measurement, ratio, money, and its advance section, trigonometry, algebra, graphs, and statistics.

The 1990s saw the courses change to be in line with other vocational offerings. On-line moderation for both courses is seen to have led to improvement in standards, and teachers of both courses participate in state-wide support networks.

The courses are flexible enough that students can do elements of both if needed eg a student could do an IVEC course in literacy, and a lower level numeracy course in the CPE.

Western Australia

As in other states, the pattern of development in WA moves from a fairly intuitive beginning in the 1970s and 1980s, with volunteers, no set curricula and a school conception of mathematics, to a gradually more formalised curriculum, and more professional demands on teachers. Unsurprisingly in a state with such a large rural and remote population, early courses offered by TAFE included external ones: Remedial Maths, and Maths 1K, a 3 level course using workbooks, textbooks and audio tapes, and organised in a similar way to school maths around 'maths topics'.

In the mid 1990s TAFE needed an accredited curriculum. They were looking for a course with clear direction and sound theoretical principles. The Victorian CGEA (Mark I) answered their needs, and it was introduced into WA in 1995, having been chosen for a number of reasons. It was competency based, providing a common language to talk about curriculum. It made it possible to offer professional development around implementation, and it provided a moderation procedure for assessment.It sets out what is to be done, but gives the teacher the professional choice of how and when to do it. Finally, being a framework rather than a prescriptive curriculum, the GCEA is seen to allow for a program broad enough to cater for all needs, an essential for the teaching of the very disparate groups of students across WA (a point made strongly in NSW as well).

The Northern Territory (NT)

Certificate in General Education
One of the first set curricula in the NT was the Certificate in General Education run by the Aboriginal Task Force through Darwin Community College and the Institute of Technology. It was developed for urban aborigines in the Darwin, Northern Qld and Broome areas, who were social security recipients working towards further education or employment. Its purpose was to help Aboriginal people move into the Public Service and/or further education. The mathematics component of the course was confined to fairly basic number skills, and the course itself was very much a general education course – with other subjects such as public speaking, current affairs etc –

[2] The AQF "is a transparent and coherent system of national qualifications owned and endorsed by Australian education ministers represented on The Ministerial Council on Education, Employment, Training and Youth Affairs." (www.aqf.edu.au/)

and a focus on passing exams. Many participants only completed the first level of the three level course (equivalent to NRS level 1). Many Level 3 graduates (equivalent to Year 11, or NRS level 3) went on to further study including university. The teachers involved were required to have a teaching qualification, and for the higher levels, post-graduate qualifications. The course still exists in a new form and is the principal course in the ATSI sector of the Northern Territory University (NTU).

Later courses used included IVEC for SIP programs in the early 1990s, the Certificate III in Workplace Education, and Advanced English for Migrants: all these included numeracy. Since 1998 however the CGEA has been used because it was mapped to the NRS levels, and this is still used, particularly for students referred by Centrelink. Senior colleges eg Casuarina College have also run numeracy courses and ANTA project funding has meant that literacy and numeracy programs have also been offered in ATSI Drug and Alcohol rehabilitation centres. The need seems never to be met. The focus in most courses is on keeping the material practical and related to daily life and what will be needed in the workforce, rather than on covering all topics or being sequential. Assessment is carried through tasks not tests.

The Northern Territory University (NTU) now has its own Certificate, mapped (like those of the ACT and Victoria) to the NRS levels.

Certificate I in General Education, Level 1

Certificate I in General Education, Level 2

Certificate II in General Education

They include such modules as 'Understanding the base 10 system' and 'Applying number skills' and are contextualised into the social and personal areas that are appropriate to the faculty. As well as more predictable modules this Certificate is remarkable for including such subjects as 'Understanding different work cultures' and 'Western uses of maths', thus taking culture and different world views into account quite explicitly.

Queensland

Early courses included the Educational Program for Unemployed Youth (EPUY), and the Certificates in Educational Access, and Vocational Studies in the mid 1980s, as well as adult numeracy volunteer tutoring which is still alive and well.

Certificate in Vocational Access

This course was the first set curriculum and it was developed by Qld TAFE in the early 1990s and followed by courses for ATSI students, similar but with an added component of indigenous studies. Both were competency based programs and for the first time required qualified teachers - with preference given to those who had primary and some high school maths. When the professional development package Adult Numeracy Teaching (ANT) (Johnston and Tout, 1995) was available it became an additional preferred qualification. Once the Australian Qualifications Framework policy began to flex its muscles there was a review of the older course and a new, again competency based, curriculum has been developed, producing Certificates I and II in Vocational Access. The revamped ATSI curriculum includes a work experience elective.

Although the earlier and later Certificates have much overlap, there is a distinct shift from an emphasis on providing 'educational and training opportunities to those who had educational and social disadvantage' in the first Certificate of Vocational Access,

towards the more strongly vocational focus of 'learners who wished to pursue a range of vocational, employment and personal goals', in the current Certificates.

The teaching of numeracy is based on a constructivist approach to learning, heavily linked in the higher modules to workplace contexts. A significant element in the course is the fact that the lowest level has been split into two sub-levels - mainly at the insistence of curriculum developers who saw a need to provide a level low enough for some success for disability students. The split has proved successful in doing this, and has also been beneficial for students who come from countries where they had no schooling. At this level numeracy starts with recognition of shape, number up to 20 and informal measurement.

National initiatives

It is clear that to meet the range of needs of different groups in different states – disability groups, remote communities, indigenous groups, youth, unemployed - a wealth of ABE programs, courses and curricula have emerged. It is understandable that there has been a growing concern that the qualifications gained by students should be nationally portable, and the number of accredited courses has grown enormously. But who are the clients for these courses?

> Vocational education and training was seen by government as too provider driven, ie. the TAFE institutions were seen as providing programs that suited their needs rather than meeting the needs of industry. The result was a shift towards an industry driven system, with industry seen as the main client of TAFE institutions, rather than students. (Leahy and Gabb, 1999)

Kell's (1998, 2000) epochs of literacy development as described in the introduction to this report, identified the early 'participation and equity' epoch as one which saw 'literacy [and numeracy] as a vehicle for individual fulfilment and participation in everyday activities'. It is essentially from the values of the early epochs that the curricula examined in this chapter have been generated. In the last five or ten years the field has seen the increasingly interventionist strategies of the federal government take shape in a number of ways, leading to a strong Vocational Education and Training (VET) sector, the development of industry based Training Packages rather than accredited courses, and a National Reporting System for LLN. Kell's later epochs - the open training market, the user pays principle - are well on their way:

> At an operational level there is increased reliance on markets. User choice policy and training packages locate fundamental education planning decisions with employers as purchasers in the training market, with a reduced role for education providers (registered training organisations) and possibly, trainees themselves. At a strategic level however, *A bridge to the future* is interventionist. It seeks to influence the behaviour of individuals, businesses and education providers by a mixture of persuasion, inducement and regulation.(Maglen and Hopkins, 1999)

This section will examine briefly three aspects of the national agenda in relation to their effect on numeracy curricula: resources, Training Packages and the National Reporting System.

Funding: resources and projects

International Literacy Year (ILY) in 1990 is squarely located in Kell's second 'epoch' of participation and equity. In 1989 there was the publication of *No Single Measure*

(Wickert, 1989), with results from the survey giving information about literacy - and some mathematical - practices, in readiness for 1990, International Literacy Year (ILY). ILY funding for literacy was becoming available. In 1992 the Australian Language and Literacy Policy (ALLP) was released. The definition of literacy espoused in 1989 by the national literacy advocacy body, the Australian Council for Adult Literacy (ACAL), explicitly stated that 'literacy ... incorporates numeracy'. Such a definition was contestable and led to problems of assimilation and marginalisation:

> The acceptance ... of numeracy integrated with literacy is at best ambiguous. When it is not mentioned specifically, we cannot be sure whether it has been overlooked or if it has been assumed to be an integral part. funding became available for numeracy as well as literacy. (Gillespie, 1991, p10)

However, it also led to funding. And the funding led to a stream of quality teaching resources such as *Maths: a new beginning* (Marr and Helme, 1987), *Strength in numbers*(Goddard et al., 1991), and *Numeracy on the line*(Marr et al., 1994). ILY and its equity focus meshed with the feminist politics of the time, and the project 'Teaching Maths to Women', when proposed by Marr and Helme, was federally funded. It soon began to generate the quite unique resources, which built on the work of the American group EQUALS (http://equals.lhs.berkeley.edu/), on teaching maths and science to disadvantaged groups, including women. The resources from that project and from others that followed are based on a constructivist approach to adult numeracy that emphasises understanding, and values language, enjoyment, interaction and the use of practical, "hands on" materials. Classrooms have been immeasurably enriched by this cluster of resources from Victorian numeracy practitioners and academics, as is evidenced in the findings of recent research into theorists familiar to literacy and numeracy teachers: Marr and Helme were preceded only by Paulo Freire and Michael Halliday (McGuirk, 2001, p60).

As the 1990s progressed, and Kell's later epochs were more in evidence, funding became more directed to workplace and VET programs, and literacy and numeracy took a lower priority. However the ongoing annual funding from ANTA for Innovative Adult Literacy projects has continued to generate many other valuable support materials for state curricula such as the *Numeracy Resource Package for Vocational Students* developed by Nancy Veal and Vicky Divett in the ACT, and later converted to 'on-line delivery to increase its potential for use by a wide audience in a range of settings'.

Training packages

There is a national debate about Training Packages, their educational and procedural soundness, their strengths and weaknesses. This is not the place to enter the wider debate. The issue at stake here is their relationship to adult numeracy (and literacy). First, what are they?

The Australian National Training Authority (ANTA) describes Training Packages as:

> sets of nationally endorsed standards and qualifications for recognising and assessing people's skills. A Training Package describes the skills and knowledge needed to perform effectively in the workplace. They do not prescribe how an individual should be trained. Teachers and trainers develop learning strategies - the "how" - depending on learners' needs, abilities and circumstances.

> Training Packages are developed by industry through national Industry Training Advisory Bodies (ITABs), Recognised Bodies or by enterprises to meet the identified training needs of specific industries or industry sectors. To gain national endorsement, developers must provide evidence of extensive consultation and support within the industry area or enterprise. (ANTA, 2002)

The Training Packages are supposed to incorporate literacy and numeracy as required for the workplace skills and competencies involved, and it is possible that some do. This is hard to monitor, because the Packages themselves are frameworks or shells rather than curricula, and without research it is not known whether students fail or drop out of their differently implemented training because of unaddressed numeracy needs. Some research has shown that at least the early versions of many Training Packages left literacy and numeracy issues to one side:

> Different understandings of the intent, underlying assumptions and principles of training packages have surfaced as have different agendas between different stake-holders, for example, employers and RTOs or workers and trainers. In some cases, there has been insufficient time to prepare for this transition and to fully understand the extent of changes required. In this context, attention to language, literacy and numeracy issues is in many respects taking a back seat to the main task of implementing a new system.(Sanguinetti and Hartley, 2000)

In the same report Sanguinetti identifies some other issues in relation to the inclusion of literacy and numeracy in the training packages examined:

- the need for professional development and training in literacy pedagogies for workplace trainers
- ensuring quality provision in a de-regulated training environment
- the tendency for literacy to be subsumed by the 'productivity imperative'
- the lack of targeted funding
- the need for literacy and numeracy to be built into and valued within enterprise cultures the confusion around what is meant by 'literacy' in the context of the workplace
- the problem of how to ensure consistent, reliable and non-discriminatory assessment processes.

That there is an absence of numeracy and literacy in the implementation of Training Packages is no surprise when some offerings of the Certificate IV for trainers – the Training Package to train people in the use of Training Packages - contain none of the LLN training required of them (McGuirk, 2000). How could trainers untrained in LLN possibly be expected to recognise or address the sometimes complex numeracy needs of their students? Some of the issues related to integration (assimilation) of literacy and numeracy into VET are taken up in the next chapter on teacher education.

A reminder: is work everything?

The rhetoric, the funding, the resources, the power, the decision makers – all would have us believe that Training Packages , done well, are the answer to our training and education needs. While this might be argued for the VET sector, it must be remembered that numeracy (and literacy) needs go far beyond the world of employment, framed in the narrow terms of the Training Packages. Way back in

1979, Charnley and Jones (1979) found that students attended adult literacy programs for a range of reasons: those related to employment outcomes however did not rate as highly as those related to the affective areas of adult learning. It might be expected that such findings would have changed. However, the assumption of the universal need to prioritise portable qualifications for work (ie the priority of portability, qualifications and work) that underpins the Training Package framework is negated by research on learners in ACE:

> In most instances, the primary motivation to undertake adult community education courses was intrinsic. This includes adult basic education classes, where success stories in numeracy and literacy abound. These success stories are based primarily on the desire of learners to break through the literacy barrier. Sometimes the reason for learning is job-related, but most often it has to do with family and community encouragement... National competency standards are less relevant in these contexts, and often assessment is rejected. Providers and participants report that formal examinations and assignments frequently are resented (p8)... ACE should not have such a strong emphasis on accredited courses. For many adults, especially those in need of basic assistance with literacy and numeracy, the awarding of a certificate is of little significance as a final outcome/product.(Batley, 2000, p59)

What some of the informants for this chapter saw as 'an obsession with VET' and Training Packages is in danger of leaving students with a blinkered view of work (Brown, 2000) and no access to the non-accredited *learning* which will always be necessary. Helen Macrae, who herself managed further education accreditation procedures for the Victorian Adult Community and Further Education (ACFE) Board during the late 1990s quarrels with accreditation:

> Accreditation has the very bad habit of making what's central to teaching and learning incidental... The CGEA is an educational pearl of great price because it gives shape and coherence to the best that we think and say about adult literacy and numeracy teaching. The certification of the CGEA is a distraction that eats up valuable funds which are urgently needed for resource development.... Worst of all, accreditation can harden inequality and entrench unjust outcomes. ... Accreditation is created and administered by the privileged, for the privileged, and endlessly protects the interests of the privileged. (Macrae, 2001)

Assessment and reporting

With the growth of a national focus came the National Reporting System (NRS) for adult English language, literacy and numeracy programmes. Building on the *National Framework of Competence in Language, Literacy and Numeracy* (Cope et al., 1993), the NRS, a competency-based document, was first available as a reporting tool in late 1995, and has been required as the reporting mechanism in an increasing number of courses and ANTA funded projects since that time:

> Language, literacy and numeracy development in adults is a complex matter and simple tools used in the past for initial and on-going assessment have either been limited in their reliability or have been extended beyond their intended functions and capabilities by current vocational education and training needs in changed social and economic circumstances....The NRS provides a uniform, national framework for reporting on the language, literacy and numeracy outcomes of students. It is intended by DETYA that the NRS will become the recognised standard used by

> educators and industry for reporting on competencies in literacy and numeracy and that it will replace current tools. (NRS website: www.nrs.detya.gov.au/nrs/index.htm).

One question that is immediately begging to be asked is, 'reporting to whom?' Industry, education providers, or students?

The tool was first developed as a mechanism for language and literacy, and it was only towards the end of the development process that a team of adult numeracy practitioners was recruited to write the numeracy components. Tout and Schmitt write:

> this group, working within very tight timelines, developed an assessment scheme that attempted to support a constructivist view of numeracy education. Student performance is assessed on the basis of four criteria, which are described somewhat differently for each of the five levels of the NRS. Generally, the criteria can be described in terms of the ability to:
>
> - identify the mathematical information and relationships in the task.
> - perform the mathematics required to carry out the task.
> - reflect on the effect of the use of the mathematics for the task, including interpreting results and commenting on the appropriateness of the mathematics for the circumstances.
> - use informal and formal language, symbolic notation, and the conventions of mathematics needed to carry out and report on the task.
>
> These indicators are then supported in detail by such criteria as mathematical knowledge, conditions of performance, problem-solving strategies, mathematical representation, and meaning-making strategies. (Tout and Schmitt, 2002, p216)

There are (at least) two problematic features of the NRS. Firstly, there is the slippage between its self-description as a 'reporting mechanism' and its inevitable use as an assessment tool.

The second problematic feature, which it shares with the Training Packages, is the reliance on a competency based framework. While CBT has a certain appeal with its belief in the possibility of itemising all the skills necessary for a complex activity in clear, unambiguous outcomes, in reality it usually leads to one of two quite different, unsatisfactory scenarios. On the one hand, there is the impossible list of precise tasks, where the elements lack any connecting theory: a scenario we know all too well from students who have failed in just such an approach to mathematics itself. On the other hand, there is the list of competencies so gloriously wide that no two assessors will have the same interpretation:

> The attempt by the NRS Document to define ambiguous, notional CBT outcomes ...seems guaranteed to generate a medieval religious hypocrisy in educational practice. The document is a collection of idealized descriptions which are impossible to measure objectively. (May, 1996)

Take a statement from above, such as 'reflect on the effect of the use of the mathematics for the task, including interpreting results and commenting on the appropriateness of the mathematics for the circumstances.' How many TAFE students or teachers would meet the numeracy standard? May continues:

> In practice, the descriptions will be solemnly decoded by moderation meetings of teachers and shoe-horned to fit whatever group of students is

> at hand. A general referendum on the meaning of those words would yield a biblical range of understandings. Is this what modern education is about? The curriculum guide which needs a theologian or a lawyer to rule on its interpretation is a throwback to the Middle Ages.

In practice what the NRS seems to be doing, at least for numeracy, is giving teachers and programs a resource for thinking about numeracy, and a chance to develop tools that suit their own needs, but can be seen to conform with the broad intent of the competencies. This requires 'solemn moderation meetings' which also work as much needed professional development. Peter Holden points also to the need for professional development, as well as to the more nuanced understanding of individual student achievement that the model allows:

> The NRS is a complex document and is not easy to understand. Its proponents will argue that this is precisely because English language, literacy and numeracy are complex skills that cannot be easily reduced to single-figure scores, reading ages or benchmarks. What the NRS does allow for is a profile that recognises that you can be at a fairly basic stage of writing ability, a slightly more advanced stage of reading, a highly skilled level of oral communication and an equally high level of numeracy ability - or any other variation.... The value and success [of the NRS] will be partly dependent on the skills of the teachers and program managers in understanding its construction and how it is used. (Holden, 1998)

One consequence of having national requirements for reporting has been that teachers and managers have been more inclined to use pre-existing courses that were already mapped to NRS, so that they do not have try to map their own to the NRS. In some ways this may work as a safeguard of standards. It may also work to diminish the number of courses specifically tailored to local needs and communitiesClearly the NRS is something that teachers and trainers must currently work with, and in many ways it is a more sophisticated tool than they have previously had at their disposal. Whether it can work as a fair reporting tool, how and to what extent it is being used as an assessment tool, needs further research. Another more holistic approach to adult numeracy assessment is being investigated currently by Beth Marr and Sue Helme (2002), as the subject of an ANTA funded project.

Changes and challenges

From its tentative beginnings in trade remedial classes more than twenty years ago, adult numeracy has come a long way. Its expanded offerings to second-chance learners in the 1980s and early 1990s put it squarely in Kell's second epoch at that time. International Literacy Year in 1990 acted as a springboard for many countries to put more money into adult literacy provision, and the 'literacy includes numeracy' understanding in Australia caused some of this money to flow towards numeracy.

The other significant influence in the shaping of numeracy curricula has clearly been the priority given to workplace reform and the provision of workplace basic skills training, in the many incarnations that that has entailed. We started in the trade courses, we have returned to VET. We are inhabiting the world of Kell's later epochs. The increasing privatisaton of numeracy and literacy provision, the shift to non-classroom delivery, the use of new learning technologies and the need to communicate both globally and locally offer huge challenges. The challenge for adult numeracy is not to see the spiral as a circle, not to see ourselves in the same place as we were twenty years ago, but to see that in addition to the explicit recognition of the

need for numeracy in workplace contexts, there are still needs of the wider community for numeracy for survival, for pleasure and for informed citizenship. We must build on the exciting developments of the last twenty years to create new ways to address these needs.

Chapter 4

Making better teachers

No common language, no curriculum, no methodology

Talking to a forum on adult numeracy in 1997, Beth Marr (1997)spoke about the social justice climate that had prevailed in Australian adult education ten years earlier and the increased access and equity provisions it brought for a range of new students - "women, unemployed people, students from other cultural backgrounds, the differently abled". Going on to speak specifically of adult numeracy teachers, she continued:

> Our pathways into the field, largely during the mid eighties and early nineties, have also been diverse: from women's education, literacy classes, ESL courses, new opportunities programs, return to study courses, and bridging programs into various trade and technical options. (p9)

She pointed out that:

> coming from such a diversity of origins and concerns, and with different types of students, we started out with no common language, no curriculum and no methodology.... Fortunately, since we were still living in enlightened times money was put into professional development, and resource creation. (p 9)

This section will try to map out the ways in which numeracy teachers have increased their skills and knowledge, through networking, the design and use of appropriate resources, and professional development. As with previous chapters, the bias of the information here leans strongly towards the East Coast (Victoria and NSW). I would like to acknowledge the work of individuals in other states, where the smaller numbers involved in the field have made the development of practice even more difficult. I hope that people from the adult numeracy field in those states will be able to add their stories to this account.

Teachers meeting: professional associations and conferences

Off and on over the last ten or fifteen years, numeracy teachers have met at state or national literacy conferences. Support networks for numeracy teachers have come and gone. In many states the local branches of ACAL have taken numeracy onto their agenda; in the early 1990s, the NSW Adult Literacy Council took on board the argument that people looking for numeracy were not necessarily going to approach an organisation labelled as 'literacy', and changed its name to the NSW Adult Literacy and Numeracy Council (ALNC). The first recorded support group in NSW had been set up by Jeanette Thiering for 'Basic Maths Educators Working With Adults' in 1982. A more informal group in Sydney, sometimes referred to as 'the Maths Mafia', generated opportunities for professional interchange, including at one point well-attended monthly meetings at the University of Technology, Sydney (UTS). In Victoria two practitioners (Dave Tout and Robyn Frances) started a network in the mid 1980s, and later VALBEC (the Victorian Adult Literacy and Basic Education Council) ran a very active numeracy network. Other states (eg Tasmania and Queensland) have run professional development courses for volunteers. At several points, different groups organised national seminars that focussed only on adult

numeracy. The first such meeting was the Critical Reflections on Numeracy Education Seminar (CRONES) in Sydney in 1991, which brought together about 20 practitioners with representatives from most states and territories.

Other meetings followed this one, usually as part of a national ACAL conference, and currently the Adult Numeracy Network of Australia (ANNA) is loosely linked to ACAL. This model of an adult numeracy interest group being set up as part of a larger organisation - here, a literacy one - is mirrored in national and international mathematics education groups. For some years, MERGA (the Mathematics Education Research Group of Australasia) has had a special interest group around adults learning maths at its conferences, and a parallel working group has met at the last two conferences organised by the International Congress on Mathematics Education (ICME) (1996, 2000). Australian practitioners have supported and been supported by both these initiatives.

In addition, however, conferences and organisations with a single focus on adult numeracy have been held to bring together researchers and experienced practitioners from around the world. In 1993 the Adult Basic Education program at UTS sent a representative to a UNESCO international seminar on adult numeracy held in Paris (CUFCO, 1995) and attended by practitioners and researchers from the Netherlands, Spain, Ireland, France, Colombia, Canada, Chile, Belgium and Australia. In 1994 the research group Adults Learning Mathematics was established by a group in the UK, with the aim of fostering international research in the field. ALM is now an international organisation which holds an annual conference and publishes a monthly newsletter as well as the conference proceedings.

A number of members of ANNA now belong to the international research forum, Adults Learning Mathematics (ALM). A question that remains is: where does ANNA belong?

> If we have an identity what is it? are we a subset of literacy? a subset of the mathematics community? or an independent body? In the literacy field we are continually fighting for a voice. In the mathematics education field we are a curiosity, although gaining a voice. As we are still few in number the independent option seems a long way down the track. (Marr, 1997 p 10)

Perhaps the challenge is how to make best use of the disparate origins and strengths of teachers in the adult numeracy field.

Help! Resources and support organisations

From the beginning of the 1980s numeracy resources designed specifically for use with adults began to emerge. A survey of the NSW journal *Literacy Broadsheet* gives a picture of the slowly changing scene with its occasional but regular reviews of small adult numeracy resources throughout the 1980s (a picture paralleled in Victoria and to a certain extent in other states). Suddenly, however, in 1989, more articles and resources are reviewed, and they cover a much wider range of topics. In 1990, there is a review of the first of what have since become core resource materials for ABE numeracy teachers: *Maths: a New Beginning*, by Beth Marr and Sue Helme, which had been published in Victoria in 1987. It was followed shortly afterwards by *Strength in Numbers*, (Goddard,1991). Readers of *Broadsheet* are pointed also to a number of other useful teaching materials, and to the report *For a Number of Reasons* (Allan and Lord, 1991) which investigates factors affecting success in adult maths

learning. There is a workshop specifically for numeracy teachers, a description of a maths class for women only, an article explicitly adressing the nature of numeracy.

Why this flurry of activity? What had happened that was not easily visible to the casual reader of *Broadsheet* was the publication in 1989 of *No Single Measure* (Wickert, 1989) , and the definition of numeracy as included in literacy (see chapter 3: National initiatives). International Literacy Year (ILY) was ready to go, with generous funding.

With funding and the development of resources came the establishment in many states of resource organisations supporting adult literacy and numeracy teaching. Depending on the particular conditions in each state, these centres served to refer students to appropriate courses, provide information, develop resources, build up libraries, manage projects and supply professional development for teachers. Some had a specific brief to address numeracy as well as literacy, and they usually acted as strong networks for practitioners in the field, as hubs of activity and ideas. The earliest was the Adult Literacy Information Office (ALIO), set up by a broad coalition of providers in Sydney in 1980, and funded through TAFE. Support services in the other states arose somewhat later, most growing out of ILY and ALLP federal funding. With one exception, these specialist centres in Queensland, Western Australia (WA), South Australia (SA) and NSW have been disbanded, with ALIO, the longest lasting, being closed – main-streamed – in 1999. The one remaining centre, ARIS – the Adult Education Resource and Information Service – in Victoria, has by default become a national resource for adult numeracy (and literacy) teachers. It keeps the field informed with newsletters about new resources, conferences and courses; it offers a substantial collection and database of teaching resources; it lends out resources; it manages a range of relevant projects; and provides some professional development for teachers in Victoria.

ARIS acts to some extent as a network for practitioners in Melbourne, but the other states seem to have lost their equivalent hubs. Perhaps this is the function of the state advocacy bodies, the literacy (and numeracy) councils, but these are largely unfunded. Perhaps it is a function that can be taken up to some extent by web-pages.

Towards a common language: professional development

Early accounts of the field confirm Marr's claim of the diverse origins of adult numeracy teachers. They ranged from people with teaching qualifications and maths degrees to others with no formal qualifications, from those in permanent positions, to others working as volunteers – a range that can still be found, though less easily. How could professional development take account of this diversity? Marr and Tout (1997) argue for the need to develop:

> four models of adult numeracy professional development and training. These can be described loosely under the categories (a) conference sessions and workshops, (b) short-term in-service programs, (c) long-term in-service programs, and (d) postgraduate study. (p. 149)

Conferences and workshops – the first category – has already been addressed under 'Teachers meeting' above. This section will document how the other forms of professional development have in fact occurred, and argue for another two categories to be included : teaching materials, and research.

Teaching materials

The first efforts focussed on the importance of shifting teachers' practice from the use of materials geared to school maths, and young people, to the use of materials that were appropriate for adults both in content and style eg (Thiering et al, 1992). Textbooks were rewritten to focus on 'Real maths' or 'Everyday maths'. Illustrations (sometimes) showed adults rather than boys on skateboards. The most significant of these projects were the materials that came out of the *Teaching Maths to Women* project in Victoria (see Chapter 3), developed by Beth Marr and Sue Helme (Marr and Helme, 1987, Goddard et al., 1991) specifically to address the needs of women returning to study. A later similar project developed materials for workers in the automotive industry (Marr et al., 1994). What was notable about these materials was that, as well as worksheets and activities, the resources included detailed guidelines for each lesson for teachers, based on the desirability for both teachers and students to have a conceptual understanding of the maths that was being taught. The materials are still in demand, far beyond their original target group, and beyond Australia. The guidelines were in themselves a notable start to addressing the need for professional development. They have had an unquestionable influence on all the Australian materials that have been developed since. Thus it would seem useful to add to the four categories, a fifth, that established by Marr and her colleagues, the model of well-guided teaching materials.

Another interesting project that focussed on workplace numeracy was *Numeracy at Work* (O'Connor et al, 1996) a resource produced:

> to assist workplace trainers to identify workplace numeracy requirements and to develop a range of training and learning responses to address some of these specific requirements. (p 5)

Other materials and practices were developed by practitioners with a background in TAFE (Allan and Lord, 1991, Highet, 1995, Lord and Lester, 1990, Webber, 1988) and, increasingly, as funding initiatives brought the second language and ABE fields closer together, from an AMES perspective (Lukin and Ross, 1996).

Short-term in-service programs

In the early 1990s there came on the scene two packages focussing more directly on professional development. In Victoria, Marr and Helme developed *Breaking the maths barrier: a kit for building staff development skills in adult numeracy* (Marr and Helme, 1991). In NSW Jeanette Thiering, past ABE head teacher and senior TAFE administrator, and a staunch advocate of numeracy, worked with a colleague to create *Numeracy and how we learn: a professional development program for teachers in technical and vocational education* (Thiering and Barbaro, 1992). Each 'kit' addressed somewhat different issues, but both contained several different modules that could be presented over a period of two or three days, and both emphasised the importance of a conceptual, contextualised approach to maths, or as it was becoming, numeracy.

An initiative that could be categorised as 'short-term in-service', and significant because of its national backing and prominence, was the 1993 *Adult Literacy Teaching (ALT)*, a substantial literacy professional development package developed under the auspices of the TAFE National Staff Development Committee (TNSDC) which included an explicit section on numeracy. Several others of the TNSDC series of professional development courses contained relevant material, but the only other

one to include a section explicitly on numeracy was Module 5 (Language in ALBE teaching and learning) in the *Inservice Program for ALBE Personnel* (1993-5).

ANT: a long-term in-service program

Marr and Tout (1997) argued that their third and fourth categories were needed because numeracy teachers, both those from a literacy and those from a mathematics teaching background, needed to confront their assumptions about mathematics and mathematics teaching if they were to offer effective learning experiences to students who had not been successful in the traditional maths classroom:

> Substantial change in teaching practice requires extensive attention to teacher attitudes and hidden theories upon which their current teaching is based. Thus the need has emerged for even more substantial, theoretically based, professional development programs, which provide opportunities for participants to reflect seriously on their current practice and the inner beliefs which guide such practice. (p. 150).

During the early 1990s, there was debate amongst practitioners and academics about the nature of numeracy, about its place in adult contexts, and about appropriate ways of teaching it. One ground-breaking research project examined the pedagogical relations between adult numeracy and adult literacy (Lee et al., 1993) and concluded that there was a:

> perceived urgent need for teacher education and professional development in mathematics. Perhaps most urgent is the need of the workplace literacy teachers who ...research their work context... their training as literacy teachers will not prepare them for the attendant conceptual and pedagogical demands. (p 92)

Out of such argument, *Adult Numeracy Teaching (ANT): Making meaning in maths* (Johnston and Tout, 1995) was born, an example of Marr and Tout's 'long-term in-service program'.

ANT is an 84-hour course structured into four modules. The theory developed over the course of ANT and named explicitly in the last section elicits from the participants through experience and discussion a comparison of the assumptions of a transmission type pedagogy, through to a more constructivist approach and the incorporation of a critical stance - presenting a widening range of alternative approaches. The course is based on three assumptions. Firstly, it was assumed that the Adult Basic Education students of the participants have usually failed in a transmission-type mathematics education and will need different teaching approaches. Secondly it was seen as important that practitioners should develop a critical appreciation of the role of mathematics in society. Thirdly, because it was seen as fundamental that a teacher must be able to do mathematics in order to teach numeracy, most of the issues dealt with in the course emerge from discussion and serious engagement with specific mathematics.

It is worth pausing for a moment to examine how this course was developed and written. One of the last in a series of ABE professional development courses generated by TNSDC, it was funded in 1994 to the tune of more than $120000 - an indication of the status that adult numeracy was beginning to achieve nationally. As is usual with such projects, there were project coordinators and various reference committees. What was not usual was the way in which the project took shape.

A small group of writers did most of the writing, but their work was crucially informed by data collected on what was happening in other states and territories, and by meetings with practitioners and academics from both NSW and Victoria. At two important stages in the first months of the project a dozen people met for two days in Sydney to give feedback on proposed outlines and theoretical frameworks, to help shape the resource and to share ideas for appropriate learning activities. Two of the writers later wrote about the excitement of this part of the process:

> We were operating with a constructivist approach to knowledge, in this case mathematics, and what we saw as the implications of such an approach for the learning, and thus the teaching, of mathematics. There was also an enthusiastic acceptance that we should incorporate relevant elements of the well-established critical literacy approach familiar to the literacy teachers amongst us.
>
> ....[One of us said] 'This vision of numeracy seems to be adding things to the maths at the core of it. It should be the maths, yes, you should be able to *do* it, and we're saying you should be able to understand what you do. But it should also include the context/s in which it is done, and an element of critique about what's being done. There's a sort of accretion, adding things to maths - to teach numeracy is teach the skills, together with conceptual understanding, context, critique ... and perhaps culture. So we could claim that this numeracy is not a subset of maths at all. In fact, we could say that numeracy is not less than maths but more! How about that for a new imperialism?'
>
> The realisation that we could fill the gaps, that we could name the absences in our varied but nevertheless flawed experiences of mathematics, was an irresistible and liberating challenge. For too long we had remained stuck in a critique that focused on what had been wrong. The construction of this new thing, numeracy, gave us a chance to be creative, to claim for it the essentials we had for so long foregone. Numeracy involved mathematics of course - how could it not? - but it was to be a mathematics in conversation with the world, where matters of life and death, survival and destruction, were not irrelevant matters, but core concerns. It was to be a mathematics used by people, meaningfully, appropriately, purposefully, justly - and enjoyably. (Yasukawa and Johnston, 2001 p 286)

It was important to the relevance and vitality of ANT that it acknowledged and developed the diverse contributions of both academics and experienced practitioners from a range of contexts. Trained and experienced literacy teachers, numeracy teachers and mathematics teachers; a mathematician, a mathematics educator, a numeracy academic... all contributed. An absence - notable now in this climate of work focussed education - was that of anyone with a strong background in workplace education.

ANT has been delivered in almost all states and territories. In the Australian Capital Territory (ACT) it has been used with school teachers as well as teachers of adults. In some states (Victoria and NSW) it has been delivered two or three times a year since it was published in 1995. Several universities give its graduates advanced credit, so that completing the course makes practitioners eligible for credit for subjects in postgraduate ABE teacher education courses.

AMES also developed an in-house graduate certificate (the Graduate Certificate in Teaching Adults ESOL, Literacy and Numeracy) but it was never really taken up,

because of the huge cuts in funding which forced cutbacks in the teaching staff, including the teachers of numeracy.

Graduate study

Over the last ten years, a number of universities across Australia have developed courses in numeracy as part of their graduate - and in one case, undergraduate - training for teachers of Adult Basic Education (ABE). At UTS numeracy was introduced in the late 1980s as one or two guest lectures in one of the literacy subjects in the Graduate Diploma in ABE. After a year or two it expanded into a whole subject, and by the early 1990s it was a core part of the course. Edith Cowan University in WA is another university where numeracy has been included in adult education courses as a subject in its own right. In the late 1990s, UTS developed a whole Graduate Certificate in Adult Numeracy, and although there was some take up of the course, the times with their increasingly casualised workforce and decreasing demand for professional education, were not right for such a venture. As well as universities, in 1995 AMES in conjunction with the Australian College of Language (ACL) developed a Graduate Certificate in Language, Literacy and Numeracy, a course which never really got off the ground because of the sudden massive cessation of funding to AMES in 1997 as services were lost in the tendering process.

A sixth category: research

Collaborative research projects offer a sixth category of professional development. An early project, funded under ILY money, Laurinda Allan's *Reflection and teaching: cooperative workshops to explore your teaching* (Allan, 1994), described the process and results of a series of workshops run by and for a group of numeracy teachers. The specific activities and time available for reflection made the experience a very valuable one for the teachers involved. Action research projects have also proved valuable paths to enhancing professional capacity, often funded by external bodies like ANTA, or encouraged as part of post-graduate programs. At the level of the individual teacher, such a project can identify a problematic area in teaching, propose a plan for addressing it and, having carried out the plan, analyse its efficacy. One such project was Lynden Dziedzic's examination of the use of journals in numeracy classes (Dziedzic, 1997). At another level, groups of teachers can work in the same way, but more broadly, and with richer results. In an effort to offer professional development to Australia's isolated numeracy teachers Marr, Johnston and Tout undertook an on-line action research project through which teachers discussed teaching issues and designed, piloted and refined resources (Marr and Johnston, 1999).(It can be argued that numeracy teachers in Australia are isolated for two reasons. First, given the vast area that Australia covers, and the very remote areas that a centre may service, many ABE teachers work in relative isolation. In addition, in any area, remote, regional or urban, a numeracy teacher is likely to be only one on a team of literacy and language teachers, and unlikely to have easy contact with other numeracy teachers.) Another collaborative project used teachers in an action research group to develop a framework and resources for *Holistic adult numeracy assessment (HANA)* (Marr, 2001). Concurrently a group of teachers in South Australia, jointly funded by the American Spencer Foundation and ALNARC created numeracy assessment materials to match the NRS indicators of competence, reflecting and reporting on the process involved (Lake et al, 2001).

Individual research can also contribute to improved professional practice. Chapman's Framework for Academic Numeracy (1998), Marr's work on language (2000),

Lukin's work on the coal industry (1998) and Johnston, Baynham, Kelly, Barlow and Mark's work on effective numeracy pedagogy for young unemployed people (1997) are all examples of work with rich implications for teaching.

Initial teacher education

In the Training for Adult Literacy project report released at the end of 2001 (Thompson and Lee, 2001) the authors point out that:

> professional development, by definition, assumes that initial training has already been completed and that teachers/trainers are now being offered something to further their skills and knowledge. (Vol 1, p 27)

So far, this chapter has made exactly that assumption. It has assumed, as has most of the field over the last 20 years that 'teacher' implied 'trained' – a graduate trained for work in the primary, secondary, or more rarely, adult, sectors. During that time the question has increasingly arisen of how those who are not trained can become adult numeracy (or literacy) teachers. (The increasing casualisation of the ABE teaching profession has meant that this question is not as urgent as it might have been under more stable work conditions.) There have been several responses to this need for initial teacher education:

- extended 'Teaching Practice' components of graduate courses to address the needs of untrained graduate applicants
- undergraduate courses resulting in a teaching qualification with a specialism in adult language, literacy and numeracy (LLN)
- the Certificate IV in Assessment and Workplace Training (AWT) (in the process of revision) increasingly required for all teachers in VET, with integrated LLN competencies

A discussion of the Certificate IV in AWT allows this chapter to address at last what has been a serious absence: the VET sector. Most numeracy teachers have been part of the ABE community, specialist teachers of numeracy, and sometimes literacy. Sometimes they have been working in the community sector, either as paid teachers, or as volunteers. Sometimes they have worked in tutorial support positions in tandem with vocational teachers. Their location in VET institutions has been an uneasy one, caught between vocational and general education. The Certificate IV in AWT however claims that all VET teachers will have some competency in LLN. How will this work?

The Certificate IV in AWT is an initial generic training qualification for VET teachers who are teaching in their field of expertise but as Jane Carnegie who has been working on a project undertaking a substantial review of the Training Package for AWT, puts it

> Many of the shonks are out there saying, go and become a trainer, but *a trainer in what*, it's actually not saying that people have to have technical or vocational competence in an area. (p 11) (my italics) (Carnegie, 2001)

In addition to the specific expertise that trainees might be assumed to have, the Certificate is supposed to generate - integrate - LLN competencies.

Integration or assimilation?

The issue of integration has been around for a long time and in different guises. In NSW teachers have been expected for some years to integrate literacy and numeracy in their teaching. The AWT Training Package advocates the integration of LLN into vocational training, and models that by integrating it into the AWT Certificate. Some research however has shown that the very variable offerings of the Certificate are not sufficient in themselves to supply complex literacy and numeracy understandings, training and assessments (McGuirk, 2000). Further research investigated factors contributing to the successful or unsuccessful implementation of literacy and numeracy in training packages in two particular workplaces. The findings revealed that:

> quality partnerships are crucial, as is flexibility in attitudes, models of training and working conditions. Experience in delivering workplace training and familiarity with competency based curriculum and training packages is also critical. Even more significant however, is that the trainers are qualified and experienced literacy and numeracy teachers. (McGuirk, 2001)

Two assertions are often made about integration:

- literacy and numeracy (or vocational and LLN) needs are woven together in real life texts and contexts
- it is therefore most effective and authentic to teach them together

It is an apparently powerful claim, but is there evidence to support it? As long ago as 1916, John Dewey argued that:

> An occupation (or vocation) is a continuous activity having a purpose. Education *through* occupations consequently combines within itself more factors conducive to learning than any other method. ...The only adequate training *for* occupations is *through* occupations. (Dewey, 1916, p 309-310)

Many Australian theorists agree with Dewey in arguing for contextualised learning of literacy and numeracy. Lee, Chapman and Roe for instance take as their starting point a belief that literacy involves 'the successful performance of operations on texts, including mathematical operations, to achieve social goals,' and that life situations or contexts are crucial factors (1993, p 7). It therefore makes sense conceptually, they argue, to begin from those contexts and teach what is necessary to make meaning, be it mathematical or non-mathematical.

What are the conditions that would allow the successful implementation of this vision? To use the words of one of the participants, Margaret McHugh, in the discussion about John Spiering's paper in the ALNARC on-line forum in April this year (ACAL, 2002) :

> We might offer our not inconsiderable skills to vocational students and their lecturers not for the purpose of teaching a literacy skill but for the purpose of ensuring that the (often rigorous) literacy demands of the formal learning environment do not continue to impede the learning progress of students who have self-selected out of a learning situation which accorded the highest value to literacy-based learning and its associated skills.

Teachers' experience in NSW would suggest that there is a range of different models that would allow literacy and numeracy integration in the classroom or workplace. Models include:

- *the collaborators*, who together plan curriculum for a group of learners, so that they address both numeracy and literacy needs as they emerge, but often teach the group separately
- *the team-teachers*, who teach with one or more other teachers, so that both numeracy and literacy are woven into each lesson
- *the Renaissance teacher*, who is at home in a range of fields of knowledge, including mathematics and language, and can address all needs - a rare creature! (McGuirk and Johnston, 1995)

One model that was seen to be unviable was:

- *the abandoned and unsupported literacy (or numeracy) teachers* who are expected to 'integrate', but through lack of at-homeness with the 'other' knowledge base - no fault of their own - can only pay token attention to numeracy (or literacy). (McGuirk and Johnston, 1995)

Exactly parallel possibilities exist for teachers to integrate LLN into Training Packages, though this undertaking is even more complex than the relatively closely aligned literacy and numeracy integration project. However, it seems to be the last, unviable model that will prevail – unless there are extensive opportunities for VET teachers to familiarise themselves with the knowledge base (actually, bases) associated with language, literacy and numeracy. When integration of two strands is not done well, it is the less valued strand that suffers. It is assimilated by the stronger strand. In ABE, it is numeracy that has often had token treatment. If trained literacy teachers find it challenging to teach numeracy, then how much more challenging will untrained teachers find it to teach not only their own subject, but also language, literacy and numeracy where relevant?

Certainly the effective incorporation of some LLN competency in the Certificate would allow vocational teachers to identify LLN needs and '[empower…] vocational trainers to address these issues within the context of their vocational training.' (Darveniza, 2001); at least, to address them to some extent, and to be aware of resources – human and otherwise – that they could draw on. Above all however it would seem imperative that we take up the findings from McGuirk's research (2001) and focus on how trained numeracy (and literacy) teachers can work in effective partnerships with their counterparts in workplace and training settings.

What makes a good numeracy teacher?

To answer this question, we need to know why we are trying to make good numeracy teachers. Who is their teaching supposed to help? Until we are clear that the teaching must be, first of all, *for the students*, we cannot identify who the teacher education is for, who the stakeholders are in the teacher education 'industry'. Secondly, we need to identify what teachers /practitioners need to know and do – knowledge and skills.

Who is teacher education for?

Who are the stakeholders? The central stakeholders must always be the students. The question must always be how do we make better teachers *for the students*, not for the

organisation, or the system, or the employer, or even the teacher herself (it is usually *her*self) though all these latter are stakeholders to a lesser degree.

The learners range from homeless young people, to retirees; from NESB learners accessing education for the first time after 20 years of child-care to young students in highly technical engineering courses in TAFE; from women looking for new careers to long-term unemployed men; from prison inmates to workers in a specific enterprise. Their purposes are as varied as their origins and include the desire for employment, but are by no means confined to it. Some will want accredited courses; some will shun them. Both the vocational education and training (VET) and adult and community education (ACE) sectors need the services of numeracy teachers.

Teachers for these learners will also come with different needs, and will need to be able to 'teach'/work in a wide range of contexts. Some will be already trained, others untrained, graduates, both needing specialist qualifications. Some will be non-graduates wanting a specialist qualification, others will be non-graduates wanting a more introductory, generic teaching qualification. Some will be in full-time permanent positions, far more will be in casual and part-time positions and a large number will be volunteers. Teacher education is needed for all these groups.

This broad context is acknowledged by Thompson and Chan Lee (2001) when they argue:

> In terms of training context, the ALBE competencies and courses may actually be broader and more inclusive than the AWT Training Package in that they cover informal community-based provision as well as accredited training in VET. ...[this is] explicit in the various references to workplace, VET, labour market and community settings, and to the need for consultation with a range of stakeholders and interest groups. In this sense, the context for these ALBE courses is wider than the 'open training market' because it includes adult literacy and numeracy training that is not driven by the training market. (Vol 1, p 14)

The knowledge base

So what should teachers of adult numeracy know and be able to do? Coben and Chanda (2000) address this question in a paper in which they document and analyse what they see as the sorry state of adult numeracy teacher education in the UK, and the Moser recommendation (DFEE, 1999) for a new qualification for teachers. But, they ask:

> will it change for the better? It remains to be seen what form the new framework, with its associated training and 'tool kit' will take, but, like the outgoing accreditation framework for numeracy teachers described above, it has developed largely without benefit of research and underpinning theory. (p 320)

They go to on argue that:

> The contrast between teacher development in adult numeracy in Australia and the 'Cinderella service' in England could hardly be greater. (p 321)

They are referring to such courses as Marr & Helme's *Breaking the maths barrier* (1991), and more particularly to *Adult Numeracy Teaching: making meaning in maths (ANT)* (Johnston and Tout, 1995). *ANT* addresses three kinds of knowledge and skills: knowledge about numeracy, knowledge about learning and teaching numeracy, and the knowledge of how to do mathematics. Let us begin with the last of these.

Knowing how to do maths

The *ANT* project team emphasised:

> the need to face squarely the fact that to teach numeracy you must know how to do mathematics, so that almost every session must include mathematical activities. ((Johnston and Tout, 1995, p x)

This concern with the mathematical knowledge base permeates much of the professional development (discussed earlier) offered to numeracy teachers in Australia. Coben and Chanda acknowledge the importance of this approach in their comparison of British and Australian numeracy teacher education:

> The ANT team thus tackle head on the question of the teacher's own grasp of mathematics, a question which parallel British initiatives have signally failed to address. (2000 p322)

It is not however a 'competency' that is acknowledged in either the early, unendorsed but widely accepted competencies identified by Hermine Scheeres and colleagues in *The Adult Basic Education profession and competence: promoting best practice* (1993), or in the later competencies of the Certificate IV in AWT. The earlier competencies include (p 24):

> Applies knowledge of theories of language and language learning and teaching...

and

> Applies knowledge of theories of mathematics learning and teaching...

but, accidentally or otherwise, they omit a competency relating to 'theories of mathematics' which would parallel 'theories of language'. Because of this absence, and in spite of the strong rationale for a mathematical knowledge base spelt out in the introduction, the competencies as elaborated in *ANT* are necessarily silent about specific mathematics knowledge (Johnston and Tout, 1995, p 4-8). Thus when Thompson and Chan Lee (2001) come to analyse the competencies as spelt out in the TNSDC ALBE professional development packages in their mapping between ALBE and AWT competencies, they too do not record, because they do not find, a 'competency' related to 'doing maths'. Neither can such a competency be found in those required for the Certificate IV in AWT. It is sometimes too easy with a competency approach, which endeavours to 'cover' the subject with a comprehensive list of individual elements, to leave out the material that binds these elements into a whole. It may seem obvious that a competent numeracy teacher must be able to 'do maths', but there is no place for this acknowledgment in either the early or later competencies. A similar fundamental absence is that of any specific competence relating to 'vocational expertise' in the Certificate itself – an absence noted and addressed by the current *Review of the Training Package for Assessment and Workplace Training* (NAWT, 2001). Teachers teach *something*, learners learn *something*, and although some of the skills and knowledge involved are generic, different content can require quite specifically different ways of 'delivery'. Generic competency is not enough for any teacher.

Knowledge of theory

Earlier, we identified six different forms of professional development that have been or are available for teachers of adult numeracy in Australia over the past fifteen or twenty years:

- guided resource materials
- conference sessions and workshops
- short-term in-service programs
- long-term in-service programs
- postgraduate study
- research

All these have generated occasions for practitioners to engage in argument and to exchange ideas, all have contributed towards the building up of a body of theory without which we must fall into the trap that Garth Boomer describes so clearly:

> While teachers operate at an intuitive level as pragmatists, not articulating to themselves the present theory which drives their practice, they are effectively paralysed in terms of their capacity to change radically. The non-theorised practitioner is a kind of well-intentioned misguided or unguided missile in the classroom, likely to take up a new idea and add it to the repertoire but unable to generate infinite practice for new contexts. (Boomer, 1986)

ANT is carefully constructed to draw participants into an understanding of the important generative power of theory for practice: theory about the role of mathematics in society, about the nature of numeracy, about learning and teaching - in this case, mathematics to adults. Learners in adult numeracy classes frequently arrive with deep fears and inadequacies in relation to mathematics. Many have been used to a transmission approach to teaching, and their teachers in this new learning situation need to understand this fear, and the style of teaching that caused it. Deliberate reflection on how adults learn, how teaching is not the same as 'delivery', and why this is especially relevant in teaching mathematics, offers teachers a chance to fundamentally change their own practice. Coben and Chanda (2000) describe the team that worked on *ANT* as embodying:

> the link between research and practice, between a university and a training and staff development institution that we have argued is greatly needed in the UK…Nor did the team shy away from theory… it has undoubtedly opened up areas for discussion on which the present English adult numeracy teaching accreditation system is silent. (p 323)

At any level of teacher education, theoretical frameworks enable teachers to 'know the trade, not only the tricks of the trade' (as the writers of the 'Training for Adult Literacy Teaching' project have entitled their report (Thompson and Lee, 2001). The report refers to and identifies the 'wealth of theory which would be relevant (indeed one might argue critical) to any VET training context' (p 22) and points out that the importance of theory is also acknowledged in the Australian Qualifications Framework (AQF)[3] *Implementation Handbook* (AQF, 2002) which indicates:

> that theory is an important component of both Certificate IV ('broad knowledge base with some theoretical concepts') and Diploma level

[3] "The AQF is a transparent and coherent system of national qualifications owned and endorsed by Australian education ministers represented on The Ministerial Council on Education, Employment, Training and Youth Affairs." (AQF website)

('broad knowledge base incorporating theoretical concepts with substantial depth in some areas'). (Thompson and Lee, 2001, p23)

Knowledge of numeracy practices

One weakness of *ANT* and some of the other adult numeracy professional development packages and courses, has been the absence of material specifically focussed on workplace and vocational learning. There are opportunities to adapt the materials to a range of contexts, but few of these have been explicitly developed. Two exceptions are *Numeracy at work* by O'Connor and colleagues (O'Connor et al, 1996), and *Numeracy on the line* by Marr and colleagues (1994).

The work done by Buckingham, Carmody, Kane, Lukin and Zevenbergen amongst others (see Chapter 2) gives material that teacher educators could take into account in widening their students' knowledge of particular sites of practice: factories, homes, airports, coal mines and construction sites, to name a few. Mike Baynham's handbook, *Investigating numeracy practices: teacher research* (1997) takes the reader through a possible process for exploring such practices.

Research on partnerships between workplace and L&N teachers (eg (Black, 1995, McGuirk, 2001), and the valuable experience of numeracy teachers who have worked as support teachers in VET, need to be mined for their findings on how to construct partnerships between adult numeracy and VET teachers, that will result in effective learning for students who have often opted out of a system which gives high value to literacy and numeracy.

The separation of knowledges

Finally, it is important to distinguish between the knowledge that is needed of a teacher by the employer, in relation to a particular organisation, and that needed by the teacher in order to be a good teacher. There needs to be a 'separation of powers' between professional knowledge and particular organisational knowledge. While it is undoubtedly beneficial for teachers to have an understanding of the broad socio-political contexts affecting their work, this is a different kind of understanding from the kind of in-house information that allows them to be compliant to the rules and expectations of a particular institution.

A common language?

Over the period covered by this review of adult numeracy, state and national professional development initiatives have given the 'field' the basis for a common language. Theory has given the field the frameworks to talk from, to contest, to change. The growth of research has fed into the debate, and international links have allowed a broader and more challenging discussion, affecting both practice and theory.

The same period has seen shifts in educational language from student to client, from education to training, from teaching to delivery, from learning to competency, reflecting shifts in the national training agenda. In her paper on ABE professional development, Sue Shore argues that the discourses of economic rationalism and the new vocationalism:

> have become enmeshed with the discourses that have served, historically, to construct the institutional practices of many TAFE and other literacy and numeracy educators. (Shore and Zannettino, 2002 p 4)

She goes on to argue that despite the 'multiple and competing subject positions' that are offered to teachers, there is evidence (Chappell, 1998, 2001) to suggest that teachers in VET have largely 'resisted the discourse of 'human capital', preferring to hold on instead to discourses of 'public service'' (p 13).

> Teachers overwhelmingly speak of equity, fairness, social justice and public access rather than profit, competition, efficiency and entrepreneurial activity when describing their work. (Chappell, 1998, cited in Shore and Zannettino, 2002 p 4))

In the casualised world of ABE teaching, where services are short-term and reliant on competitive tenders, where teachers must comply with ever-increasing expectations from above, we are nevertheless back to the values referred to in the quote by Beth Marr at the beginning of this chapter. The report of the Training for Adult Literacy Teaching project confirms this finding for the sub-group of adult literacy and numeracy teachers:

> The understandings and values that underpin the ALBE professional development program [of the mid 1990s] remain absolutely current and critical to their work. Indeed it will be argued later that this foundation is at the very heart of the changes needed by the generic AWT competencies. (Thompson and Lee, 2001 p 13)

Clearly teachers of adults generally, including teachers of adult numeracy in particular ways, have many contributions to make to the wider adult education field and many unresolved debates that need not be seen as obstacles, but rather as the drivers of change.

Conclusion

Adult numeracy and public education

To frame the conclusion, I want to use the responses of the seventeen interstate interviewees who spoke to us about changes in adult numeracy. They were all people with considerable experience in relation to numeracy in their state, and although the small sample means that we cannot take them as representative of their state, overall their responses to questions about state and national influences on development give a powerful picture of the issues. The two questions from the interview that are relevant here, concern firstly, political and social drivers of change, and secondly, theoretical drivers of change.

What do you see as the most important state and national factors influencing change over these years?

When asked to identify political and social drivers of change in relation to the numeracy field over the last twenty years few of the interviewees from the different states had been involved for long enough to have experienced adult numeracy as the (very) 'poor cousin' of Kell's five epochs. Some could remember the excitement of the 'participation and equity' epoch described by Marr (1997):

> It is important in these difficult times of restricted funding to realise that the journey of adult numeracy has been a highly political one. A journey begun through 'equal opportunity' and 'social justice' beliefs and concern for people. Beliefs which influenced funding to a system which gradually began to realise that TAFE had to cater for new kinds of students, different from those it had been the accustomed to - women, and marginalised groups. And not only TAFE. New kinds of learning establishments were created through community education, community houses, neighbourhood learning centres and the like. (p8)

The establishment of the Australian Council of Adult Literacy, International Literacy Year and the policies (eg the Australian Language and Literacy Policy) which it gave rise to were all part of this epoch of generous funding. These years saw projects like the 'Teaching Maths to Women' project, a range of practitioner initiated research and materials projects, an increase in explicit numeracy provision for a range of community and vocational students, and a growth of professionalism in the early 1990s culminating in graduate numeracy subjects, and the national professional development package, Adult Numeracy Teaching.

To understand how this period was at the same time giving way to the 'epoch of the open training market and seamless web' we would need to go to broader analysis of the development of adult literacy (eg Bianco and Wickert, 2001, Kell, 1998, Wickert, 1998, 2001). Adult numeracy, for these purposes, sits within that rather wider history. The primary commitment to equity and social justice was gradually replaced at government level by the guiding principle of economic rationalism. It is this climate that was seen as the overwhelming driver of change by most of the respondents in our inter-state survey, when they named the increase in privatisation of education provision, the tendering out of services, the 'commodification' of education, 'people' becoming 'human resources': these elements are echoed in Wickert's (1998) description of the 'dual thrust' of restructuring:

> Educators cannot ignore the impact of globalisation on contemporary governments ....education's traditional role in the production of citizens in the interests of national identity is being displaced by a requirement that education deliver productive 'human capital' in the interests of international competitiveness. Alongside this challenge has been the related insistence that the public sector itself become more efficient, more effective, more competitive... The resulting reform of public administration, often referred to as 'corporate managerialism' ... is characterised by, amongst other things, a focus on targets and outcomes, reporting systems against performance indicators, strategic planning and performance based contracts of employment. (p1)

The response by policy activists in the field was to try to safeguard funding for literacy and numeracy. To do this, it seemed that literacy and numeracy had to become part of mainstream VET provision. To begin to understand the complex ramifications of this move is an exploration far beyond what I am attempting here, and once again I will confine myself to the responses from the interviews. The move has entailed for them what they see as an 'obsession with VET', an emphasis on keeping people off the streets and getting them into jobs, rather than educating them, with funding for both student and provider often linked to that success. Teachers have become causalised, de-professionalised, less able to advocate for either their program or their students. Adult General Education, or the equivalent department of literacy and numeracy programs in various state institutions, has an uncomfortable position in relation to VET.

As the national agenda strengthened, accreditation and articulation were given more emphasis, assessment was standardised through the NRS, and Industry Training and Assessment Boards (ITABs) developed Training Packages for individual industries (eg horticulture, business) incorporating literacy and numeracy competencies. Funding conditional on, for example, providing accredited courses, pushed the interventionist agenda. As one respondent said: 'Accreditation buys the dollars' Another respondent working with dole schemes and Centrelink referrals, said that the national requirements for reporting forced her into using pre-existing courses that had already been mapped onto the NRS, rather than trying to customise her own courses. Competency based training was another influence seen to be working against the customising of curricula for the very different needs of particular groups in different states because:

> CBT devalues the culturally-specific knowledges, skills and communicative styles of indigenous Australians and many non-English speaking communities (Seddon et al., 2002, p29)

State differences were seen as very important. In WA for instance, the large proportion of population in rural and often isolated conditions, and, compared to other states, the very large Aboriginal population in small isolated communities constitute a scenario in which the great cultural differences need far more carefully customised curricula.

The adult numeracy practitioner community itself was also seen as playing an important national role:

> a core group of individuals, both practitioners and academics, who had seen numeracy and maths differently was the critical factor in keeping the curriculum process on the right path despite pressures from outside. (interview respondent)

Much work in ABE is firmly state-based. Initiatives in one state do not always permeate through to the everyday worlds of teachers in other states. One element in numeracy development that was different, and bridged state boundaries, was the common feminist and social justice background of several individuals from NSW and Victoria. This network, which gradually grew to include people from most states, produced curriculum documents and provided professional development. It was through this group that adult numeracy is becoming not just an add-on to literacy, not just a variant of maths education, but a field in its own right. It is developing its own theoretical frameworks. And so we come to the second of the questions posed to the interviewees.

What do you see as the most important theoretical factors influencing change over these years?

The making of adult numeracy it would seem from the interviews owes debts to a number of fields: maths education, literacy education, adult education, learning to learn theories, work-based learning, and, of course, maths itself.

The early 'poor cousin' days of numeracy saw it as maths, teaching it much as it had been taught, often unsuccessfully, in schools. New influences in maths education were taken up quickly by the adult field in an effort to find ways to help students who had failed under the old traditions. A more constructivist approach to learning that acknowledged the importance of concrete materials, language and interaction became a base line for adult numeracy. A more social approach to the mathematics itself, paralleling the social approach to language in Australia, insisted that social context was crucial and that numeracy should be grounded in real-life situations. A genre approach, generalised to mathematics, provides a foundation for the CGEA, the *National Framework of Adult Language, Literacy and Numeracy Competence*(Cope et al., 1993) and the NRS.

At the same time the 'learning to learn' approach was affecting the whole ABE profession, and was reinforced by an important strand of adult numeracy that foregrounded what was called 'maths anxiety'. Earlier learning experiences were deconstructed and challenged, and reflection on the learning process became as important a part of the course as the actual maths itself. This approach was in keeping with adult education theory that emphasised the autonomy of adult learners, the need to negotiate appropriate learning and, for some, the importance of a critical approach to knowledge. As the role of teacher shifted from simple expert, the power relation between student and teacher also shifted. Some interviewees pointed out that with the opening up of negotiation, team teaching became more common. It was this adult education approach that provided the theoretical justification for such projects as the 'Teaching Maths to Women' project.

As well as being one model for a social approach to knowledge, respondents saw that adult literacy has provided other frameworks for theorising about numeracy. In particular, adult numeracy has benefited from a critical literacy framework, which helps to bring numeracy in out of the 'value-free' regions to which if has too often been relegated. The important work initiated by Lee, Chapman & Roe (1993) on numeracy practices - how numeracy is done by people in everyday situations - is being built on, and is making links with work done on literacy practices.

The competency framework which so pervades all teaching situations currently, hardly deserves the label 'theory'. For most of the respondents, CBT is a given, and

critique is almost impossible. One respondent pointed out that the earlier *National Framework of Adult Language, Literacy and Numeracy Competence*(Cope et al., 1993) had tried to reclaim the idea of competence, from the atomised tick box approach to something more holistic. Curriculum in NSW for some years took on board this wide model of competence interpreting it as a basis for integrating the teaching and learning of literacy and numeracy. Further integration - this time of LLN into VET - now promises (or threatens?) the continued existence of LLN. However, Training Packages, written in CBT format, delivered by trainers trained in CBT, do not have much space for theory, even about CBT. Without theory teachers and taught are, in Garth Boomer's phrase, 'unguided missiles'(1986), unable to do more than reproduce rote learnt competencies, and unable to generate new responses to new and unexpected situations.

What have we done? What have we learnt?

Are there achievements we should proud of? What are the most urgent gaps to address? What have the last twenty years taught us about adult numeracy?

Chapter 1 surveyed a range of surveys which give some information about how Australians measure up in relation to world numeracy standards. The available findings tells us that, internationally, we are probably fairly middling, and that there are groups in our own society whose scores are predictably low, but above all, they tell us that we simply don't have enough information to say how numerate Australians are. The surveys whose results we have, have not been measuring numeracy but only a small sub-set of it - quantitative literacy. We need more information. We need to know who are the people who are missing out.

If numeracy is not important in an adult's life then perhaps we do not need to measure it, or keep count of its levels and distribution in the population. However, the work that is being done on numeracy practices (Chapter 2), on how people use mathematics in their daily lives - in work, for leisure, for citizenship - suggests that to be numerate is crucial in a range of ways, from getting and maintaining a job, to being aware of critical safety procedures, to knowing how to use appropriate networks and mediators. It has also begun to show the extent to which numeracy knowledge is situated, and the importance of understanding what knowledge people have before providing other learning that may be redundant or irrelevant.

The latter two chapters of the report focus more on the educational context of adult numeracy: on curricula and teachers. Chapter 3 shows how in different states and different times, different theoretical or political frameworks have shaped curricula in powerfully different ways. Chapter 4 gives a picture of how professional development has contributed to the national scene.

When Australian adult numeracy practitioners started to develop international contacts in the early 1990s, they were surprised at how much they had to offer other countries. Diana Coben, founder of Adults Learning Mathematics (ALM), and Noyona Chanda identified Australia as 'one country where adult numeracy teacher development has been taken seriously for some time'(2000, p321) and went on later in the same article to say:

> It appears from this distance as if, on every count, the Australian project puts the English numeracy teacher development system comprehensively in the shade. (p323)

Canadian writer John Dingwall (2000) was also impressed with Australian work in professional development:

> Internationally, the country that has the most well developed programs for teacher training is Australia, which has developed both shorter courses and more extensive programs. (p38)

Australian participation as international keynote speakers, as guest facilitators, as contributors to international handbooks, as newsletter editors and on the ALL development committee attests to the respect in which Australian adult numeracy field is held.

This international profile however is seen by the national numeracy network as the result of more fundamental achievements. The network has worked hard to keep numeracy on the agenda. It has worked to develop a more complex and a more useful theoretical conceptualisation of numeracy, as well as to construct a new approach to adult numeracy teaching, both of which have drawn on a very wide range of theories and practices. These two initiatives have informed each other, resulting in a strong and theoretically based teaching practice. It is these two strands - the understanding of what numeracy is, and the careful, imaginative and informed development of teaching practice and resources - that are the foundation of our international identity.

Using the backgrounds of numeracy teachers, Beth Marr (1997) points to some of the factors that have contributed to the making of adult numeracy:

> From the world of the maths teachers - primary and secondary - we have inherited an active approach to learning maths, using concrete materials, hand-on activities and group work. We have learnt to value problem solving and investigations, and to promote talk rather than silence in our classrooms. From literacy and language teachers, we have learnt ways of focussing on language and its structures to help students learn, and have developed a critical approach, and an understanding of mathematics as practice, parallel to the understanding of literacy as a social practice. From trade teachers, we have learnt to understand the importance of different contexts and how to teach about the application of mathematics in the real world. From humanities teachers we have, importantly, learnt to include a crucial social and historical perspective on what we are teaching. What we have learnt, in sum, is to see *numeracy* as making meaning of maths, and *mathematics* as a tool to be used efficiently and critically. (p9)

We have also learnt that numeracy teachers respond enthusiastically, even passionately, to this approach which allows them ownership of knowledge and pedagogy. We have not yet been able to ensure that all or even most teachers of adult numeracy should be adequately qualified.

One of the current challenges is to maintain and build on what we have so far achieved. In the face of a discourse of assessment and competence, concerns about equity, knowledge and understanding seem almost romantic. We have learnt that to be 'incorporated in literacy' was both good - it brought us funds - and bad - it made us invisible. There is strong push at present to incorporate language, literacy and numeracy - all of them - into VET. Will this road to a sort of survival lead ultimately to another invisibility? Are we now learning that all the richness that we have created is to be corralled into a minimalist, industry driven, competency-based training? How can we re-imagine the place of numeracy in adult education? We cannot return to the exciting but, apparently, naïve days of the 'paticipation and equity' epoch, but we do

not have to accept as given the narrowness of the current VET agenda. . We can begin by trying to understand the histories of VET and adult community education not as policy-driven 'epochs', but as unstable, changeable outcomes of practical politics. We can ask in whose interests the outcome is working. We can rethink what 'vocation' and 'knowledge' mean, what 'public education' entails. We can reconsider who the people are who need to be numerate, who the teachers are that can teach them. We can ask where the cracks are through which we can contest in some small but numerate way, the blinkered race for 'global economic competitveness', and support instead the kind of litelong learning that shapes and is shaped by cultural diversity and ecological sustainability.

Neil Postman (1995) offers one view of public education:

> ... public education does not serve a public. It creates a public. . . . The question is, What kind of public does it create? A conglomerate of self-indulgent consumers? Angry, soulless, directionless masses? Indifferent, confused citizens? Or a public imbued with confidence, a sense of purpose, a respect for learning, and tolerance? The answer to this question has nothing whatever to do with computers, with testing, with teacher accountability, with class size, and with the other details of managing schools. The right answer depends on two things, and two things alone: the existence of shared narratives and the capacity of such narratives to provide an inspired reason for schooling. (p17-18)

What public do we wish our public education to create? What narratives do we wish to share?

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Appendix 1

Definition of numeracy: Adult Literacy and Lifeskills Survey

'Numerate behaviour is observed when people manage a situation or solve a problem in a real context; it involves responding to information about mathematical ideas that may be represented in a number of ways; it requires activation of a range of enabling knowledge, behaviours and processes.'

Both this definition and the expanded version below can be found in the *ALL Working Draft: Numeracy* [www.ets.org/all/numeracy.pdf accessed 14/5/02]

Numerate behaviour involves

managing a situation of solving a problem in a real context
everyday life
work
societal
further learning

by responding
identifying or locating
acting upon
interpreting
communicating about

to information about mathematical ideas
quantity and numbers
dimension and shape
patterns and relationships
data and chance
change

that is represented in a range of ways
objects and pictures
numbers and symbols
formulae
diagrams and maps
graphs
tables
texts

and requires activation of a range of enabling knowledge, behaviours and processes
mathematical knowledge and understanding
mathematical problem solving skills
literacy skills
beliefs and attitudes

Appendix 2

The telephone interview questions

about adult numeracy curriculum, pedagogy and policy in different states in Australia

Introduction:

In this project, we are wanting to convey a broad historical perspective of how and why numeracy curricula have changed over the years. We are wanting the broad brushstrokes, more than the fine details.

1 What institutions or organisations in your state offer or have offered adult numeracy courses over the last 20 or so years?

- TAFE
- ACE
- ACFE
- AMES
- prisons
- Private providers
- Mission Australia eg
- Workplace
- Industry/TAFE partnerships
- Other (name them)

2 What is the earliest curriculum/framework/program for adult maths or numeracy [in your state…] that you are aware of? (name?)

- When did it begin?
- who was its "audience" (students/clientele)?
- what was its content?
- what was its apparent understanding about maths, numeracy?
- What was its approach to teaching & learning?
- What qualifications were teachers required to have to teach it?

3 what other curriculum/framework/s followed? (name?)

- why did it change?
- How was it different from the previous one?
- When did it begin?
- who was its "audience" (students/clientele)?
- what was its content?
- what was its apparent understanding about maths, numeracy?
- What was its approach to teaching & learning?
- What qualifications were teachers required to have to teach it?

4 [If not answered in the above] What do you see as the most important state and national factors influencing change (policy, events) over these years?

5 [If not answered in the above] What do you see as the most important theoretical factors influencing change over these years?

6 What metaphor most closely matches your early experiences of adult numeracy curricula?

7 What metaphor matches your experience of current adult numeracy curricula today?

Appendix 3

Respondents to the questionnaire

We are very grateful to the following people for providing information about numeracy related issues in their states. We have not been able to do justice to the wealth of information provided by them and by documents we accessed and we take full responsibility for the picture of the states provided in the report. We would be grateful for additional information that would make these accounts more accurate. Any such information could be sent to Betty.Johnston@uts.edu.au.

Sybil Beattie	NSW
Theresa Caldwell	NT
Jo Camilleri	WA
Helen de Silva Joyce	NSW
Christine Erskine	NSW
Gail FitzSimons	Vic
Kristine Highet	NSW
Sheilagh Kelly	NSW
Cathy Leung	Qld
Margaret Liley	Qld
Dina Petrakis	NSW
Roy Pugh	Tas
Lorraine Sushames	NT
Jim Thompson	WA
Dave Tout	Vic
Nancy Veal	ACT
Tess Were	SA

Appendix 4

Acronyms and abbreviations

AAMT	Australian Association of Mathematics Teachers
ABE	Adult Basic Education
ABS	Australian Bureau of Statistics
ACAL	Australian Council for Adult Literacy
ACE	Adult and Community Education
ACL	Australian College of Language
ACT	Australian Capital Territory
ALBE	Adult Literacy and Basic Education
ALIO	Adult Literacy Information Office
ALL	Adult Literacy and Lifeskills
ALLP	Australian Language and Literacy Policy
ALNC	Adult Literacy and Numeracy Council (NSW)
ALT	Adult Literacy Teaching
AMES	Adult Migrant English Service
ANNA	Adult Numeracy Network of Australia
ANT	Adult Numeracy Teaching
ANTA	Australian National Training Authority
AQF	Australian Qualifications Framework
ATSI	Aboriginal and Torres Strait Islander
AWT	Assessment and Workplace Training
CGEA	Certificates in General Education for Adults
CRONES	Critical Reflections on Numeracy Education Seminar
DET	Department of Education and Training
IALS	International Adult Literacy Survey
ICME	International Congress on Mathematics Education
ILY	International Literacy Year
IVEC	Introductory Vocational Education Certificate
LANT	Literacy and Numeracy Training
LLN	Language, literacy and numeracy
LLNP	Language, Literacy and Numeracy Program
MERGA	Mathematics Education Research Group of Australasia
NRS	National Reporting Systm
NSW	New South Wales
NT	Northern Territory
OECD	Organisation for Economic Cooperation and Development
Qld	Queensland
SA	South Australia
TAFE	Technical and Further Education
Tas	Tasmania
TNSDC	TAFE National Staff Development Committee
UTS	University of Technology, Sydney
VALBEC	Victorian Adult Literacy and Basic Education Council
Vic	Victoria
WA	Western Australia
WELL	Workplace English Language and Literacy

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